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1919

REPORTS OF THE

DEPARTMENT OF THE INTERIOR

FOR THE FISCAL YEAR ENDED JUNE 30

1919

VOLUME I

SECRETARY OF THE INTERIOR
BUREAUS, EXCEPT OFFICE OF INDIAN AFFAIRS
AND RECLAMATION SERVICE
ELEEMOSYNARY INSTITUTIONS

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REPORTS OF THE DEPARTMENT OF THE INTERIOR.

Administrative reports, in 2 volumes.

Vol. I. Secretary of the Interior.
Bureaus, except Office of Indian Affairs and Reclamation Service.*
Eleemosynary institutions.

Vol. II. Indian Affairs.
Territories.

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*The Report of the Reclamation Service is not included in this report as it is made to Congress and printed under its direction.

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REPORT OF THE SECRETARY OF THE INTERIOR

BUREAUS OF THE INTERIOR DEPARTMENT.

The Department of the Interior was established by the act of March 3, 1849 (9 Stat. L., 395).

GENERAL LAND OFFICE.

Organized as a bureau of the Treasury Department under act of April 25, 1812 (2 Stat. L., 716).

First commissioner, Edward Tiffin, of Ohio; appointed May 7, 1812.

Became a bureau of the Interior Department when that department was organized under the act of March 3, 1849 (9 Stat. L., 395).

INDIAN OFFICE.

Organized as a bureau of the War Department under act of July 9, 1832 (4 Stat. L., 564).

First commissioner, Elbert Herring, of New York; appointed July 10, 1832.

Became a bureau of the Interior Department when that department was organized.

BUREAU OF PENSIONS.

Organized as a bureau of the War Department under act of March 2, 1833 (4 Stat. L., 622).

First commissioner, James L. Edwards, of Virginia; appointed March 3, 1833.

Became a bureau of the Interior Department when that department was organized.

PATENT OFFICE.

Organized as a bureau of the State Department under act of March 4, 1836 (5 Stat. L., 117).

First commissioner, Henry S. Ellsworth, of Connecticut; appointed July 4, 1836.

Became a bureau of the Interior Department when that department was organized.

BUREAU OF EDUCATION.

Organized under act of March 2, 1867 (14 Stat. L., 434).

Became a bureau of the Interior Department July 1, 1869, under act of July 20, 1868 (15 Stat. L., 106).

First commissioner, Henry Barnard, of Connecticut; appointed March 14, 1867.

GEOLOGICAL SURVEY.

Organized as a bureau of the Interior Department under act of March 3, 1879 (20 Stat. L., 394).

First director, Clarence King, of New York; appointed April 14, 1879.

RECLAMATION SERVICE.

Organized under act of June 17, 1902 (32 Stat. L., 388), under the Director of Geological Survey, Charles D. Walcott.

First director, F. H. Newell, of Pennsylvania; appointed March 9, 1907.

BUREAU OF MINES.

Organized as a bureau of the Interior Department under the act of May 16, 1910 (36 Stat. L., 369).

First director, Joseph A. Holmes, of North Carolina; appointed September 3, 1910.

NATIONAL PARK SERVICE.

Organized as a bureau of the Interior Department under the act of August 25, 1916 (39 Stat. L., 535).

First director, Stephen T. Mather, of Illinois; appointed May 16, 1917.

DEPARTMENT OF THE INTERIOR.

Secretary of the Interior	Franklin K. Lane.
First Assistant Secretary	Alexander T. Vogelsang.
Assistant Secretary	Selden G. Hopkins.
Assistant to the Secretary	John W. Hallowell.
Administrative Assistant	Jos. J. Cotter.
Chief Clerk of the Department	E. J. Ayers.
Commissioner of the General Land Office	Clay Tallman.
Assistant Commissioner	Charles M. Bruce.
Commissioner of Indian Affairs	Cato Sells.
Assistant Commissioner	Edgar B. Meritt.
Commissioner of Pensions	Gaylord M. Saltzgaber.
Deputy Commissioner	Edward C. Tieman.
Commissioner of Patents	James T. Newton.
First Assistant Commissioner	Robert F. Whitehead.
Assistant Commissioner	Melvin H. Coulston.
Commissioner of Education	Philander P. Claxton.
Director of the Geological Survey	George Otis Smith.
Director and Chief Engineer of the Reclamation Service	Arthur P. Davis.
Chief of Construction Reclamation Service	Frank E. Weymouth.
Chief Law Officer Reclamation Service	Will R. King.
Supervising Engineer Reclamation Service	Morris Bien.
Director of the Bureau of Mines	Van. H. Manning.
Assistant Director	Frederick G. Cottrell.
Director of the National Park Service	Stephen T. Mather.
Assistant Director	Arno B. Cammerer.
Chairman Alaskan Engineering Commission	Col. Frederick Mears, U. S. Army.
Governor of Alaska	Thomas Riggs, jr
Governor of Hawaii	Charles J. McCarthy.
Superintendent of Capitol Building and Grounds	Elliott Woods.
Superintendent of Saint Elizabeth Hospital	Dr. William A. White.
President Columbia Institution for the Deaf	Dr. Percival Hall.
President Howard University	Dr. J. Stanley Durkee.
Surgeon in Chief Freedmen's Hospital	Dr. William A. Warfield.

REPORT OF THE SECRETARY OF THE INTERIOR.

DEPARTMENT OF THE INTERIOR,
Washington, D. C., November 30, 1919.

MY DEAR MR. PRESIDENT: I wish to make report upon the administration of this department for the past year and in doing so to primarily deal with coal, electricity, and petroleum, as the three sources of light, heat, and power, and the need for the adoption of certain constructive policies affecting their production and distribution.

In an age of machinery the measure of a people's industrial capacity seems to be surely fixed by its motive power possibilities. Civilized nations regard an adequate fuel supply as the very foundation of national prosperity—indeed, almost as the very foundation of national possibility. I am convinced that there will be a reaction against the intense industrialism of the present, but as it must be agreed that the race for industrial supremacy is on between the nations of the world, America may well take stock of her own power possibilities and concern herself more actively with their development and wisest use.

THE COAL STRIKE.

The coal strike has brought concretely before us the disturbing fact that modern society is so involved that we live virtually by unanimous consent. Let less than one-half of 1 per cent of our population quit their work of digging coal and we are threatened with the combined horrors of pestilence and famine.

It did not take many hours after it was realized that the coal miners were in earnest for the American imagination to conceive what might be the state of the country in perhaps another 30 days. Industries closed, railroads stopped, streets dark, food cut off, houses freezing, idle men by the million hungry and in the dark—this was the picture, and not a very pleasant one to contemplate. There was an immediate demand for facts.

How much coal is normally mined in this country?

By whom is it mined?

What is its quality?

To what uses is it put?

Who gets it?

How much less could be mined if coal were conserved instead of wasted?

What better methods have been developed for using coal than those of ancient custom?

Who is to blame that so small a supply is on the surface?

Why should we live from day to day in so vital a matter as a fuel supply?

What substitutes can be found for coal and how quickly may these be made available?

This is by no means an exhaustive category of the questions which were put to this department when the strike came. And these came tumbling in by wire, by mail, by hand, from all parts of the country, mixed with disquisitions upon the duty of Government, the rights of individuals as against the rights of society, the need for strength in times of crisis, calls for nationalization of the coal industry, for the destruction of labor unions, for troops to mine coal, and much else that was more or less germane to the question before the country.

Many of these questions we were able to answer. But if coal operators themselves had not carried over the statistical machinery developed during the war, we would have been forced to the humiliating confession that we did not know facts which at the time were of the most vital importance.

In a time of stress it is not enough to be able to say that the United States contains more than one-half of the known world supply of coal; that we, while only 8 per cent of the world's population, produce annually 46 per cent of all coal that is taken from the ground; that 35 per cent of the railroad traffic is coal; that in less than 100 years we have grown in production from 100,000 tons to 700,000,000 tons per annum; that if last year's coal were used as construction material it would build a wall as huge as the Great Wall of China around every boundary of the United States from Maine to Vancouver, down the Pacific to San Diego and eastward following the Mexican border and the coast to Maine again; and that this same coal contains latent power sufficient to lift this same wall 200 miles high in the air, according to one of our greatest engineers (Steinmetz).

Such facts are surely startling. They serve to stimulate a certain pride and give us a great confidence in our industrial future; yet they are not as immediately important, when the mines threaten to close, as would be a few figures showing how much coal we have in stock piles and where it is! And months since we called upon Congress to grant the money that we might secure these figures, but no notice was taken of the urged requests until, late in the summer, a committee of the Senate awoke to this need and indorsed our petition.

NATIONAL STOCK TAKING.

The Government should have a more complete knowledge of the coal and of other foundation industries than can be found elsewhere, and we should not fear national stock taking as a continuing process. It is indeed the beginning of wisdom. The war revealed to us how

delinquent in this regard we had been in the past. One day when the full story is told of the struggle of the Army engineer to meet war emergency demands, and this is supplemented by the tale of the effort made by the Council of National Defense and the War Industries Board, it will be realized more seriously than now how little of stock taking we have done in this generous, optimistic land.

When any such undertaking is proposed, however, it at once appears to arouse the fear that it is somehow the beginning of a malevolent policy called "conservation," and conservation has had a mean meaning to many ears. It connoted stinginess and a provincial thrift, spies in the guise of Government inspectors, hateful interferences with individual enterprise and initiative, governmental haltings and cowardices, and all the constrictions of an arrogant, narrow, and academic-minded bureaucracy which can not think largely and feels no responsibility for national progress. Needless to say this fear should not, need not be. The word should mean helpfulness, not hindrance—helpfulness to all who wish to use a resource and think in larger terms than that of the greatest immediate profit; hindrance only to those who are spendthrifts. A conservation which results in a stalemate as between the forces of progress and governmental inertia is criminal, while a conservation that is based on the fuller, the more essential use of a resource is statesmanship.

To know what we have and what we can do with it—and what we should not do with it, also!—is a policy of wisdom, a policy of lasting progress. And in furtherance of such a policy the first step is to know our resources—our national wealth in things and in their possibilities; the second step is to know their availability for immediate use; the third step is to guard them against waste either through ignorance or wantonness; and the fourth step is to prolong their life by invention and discovery.

COAL AS A NATIONAL ASSET.

Enough has been said, perhaps, to indicate how vast are the fields of coal which this country holds. It may be that any day some genius will release from nature a power that will make of little value our carboniferous deposits save for their chemical content. By the application of the sun's rays, or the use of the unceasing motion of the waves of the sea, the whole dependence of the world upon coal may be upset. That day, however, has not yet come; and until it does we may consider our coal as the surest insurance which we can have that America can meet the severest contest that any industrial rival can present. It is more than insurance—it is an asset which can bring to us the certainty of great wealth, and if we care to exercise it, a mastery over the fate and fortunes of other peoples.

Next to the fertility of our soil, we have no physical asset as valuable as our coal deposits. Although we are sometimes alarmed because those deposits nearest to the industrial centers are rapidly declining and we can already see within this century the end of the anthracite field, if it is made to yield as much continuously as at present, yet it is a safe generalization that we have sufficient coal in the United States to last our people for centuries to come. An extra scuttleful on the fire or shovelful in the furnace does not threaten the life of the race, even if some Russian or Chinese of the future does not resolve the atom or harness the hidden forces of the air. Whatever fears other nations may justifiably have as to their ability to continue in the vast rush of a machine world, there can be no question of our ability to last.

The present strike, however, makes quite clear, perhaps for the first time, that it is not the coal in the mountain that is of value, but that which is in the yard. And between the two there may be a great gulf fixed. Therefore, we are put to it to make the best of what we have. We turn from telling how much coal we use to a study of how little we can live upon and do the day's work of the Nation. And this is, I believe, as it should be. Indeed I feel justified in saying that the problem of this strike is not to be solved in its deeper significances until we know much more about coal than we know now, and this especially as to the manner in which it is taken from its bed and brought to our cellars.

PUBLIC RESPONSIBILITY.

This transfer is effected by a kind of carrier chain, the links of which are the operator, the miner, the railroad, and the public. We choose, to please ourselves, the link in this chain upon which we place the responsibility for its failure to work; but before indulging ourselves in abuse of arrogant coal barons or dictatorial labor unions, it may be as well to ask whether we of the public are not responsible in some part for this failure to function. I do not refer now to the failure of society to provide methods of industrial mediation or other adjustment of such labor difficulties. My question is, whether or not the public is at all at fault when a nation wealthy beyond all others in coal finds itself with so small a supply on hand when a strike comes—but a few days removed from the gravest troubles. The answer, to my mind, turns upon the manner in which we have done business.

We have been content to go without insurance as to a coal reserve. Each day has brought its daily supply. There was no thought of railroads stopping or mines closing down, so that large storage facilities have not been provided, and, indeed, we would rebel at paying for our coal the added cost of caring for it outside its native warehouse. We have not thought in terms of apprehension, but, as

always, in the calm certainty that the stream of supply would flow without ceasing. In some way there would be coal into which we could drive our shovels when the need was felt.

No wonder, therefore, that we are rudely disturbed when one link in the carrier chain from coal-in-place to coal-in-the-furnace breaks. It simply is one of those things which doesn't happen. And not having happened sufficiently often to give us fear, we have had no thought that we should provide against it. It is a most heterodox thing to say, but we may find that a bit more foresight on the part of the public would certainly have made less sudden the present crisis. Let us look, for instance, into the matter of the coal miners' year and see if it is not fixed in some degree by the habit of the public in its purchasing.

THE MINERS' YEAR.

The record year, 1918, with everything to stimulate production had an average of only 249 working days for the bituminous mines of the country. This average of the country included a minimum among the principal coal-producing States of 204 days for Arkansas and a maximum of 301 for New Mexico. In such a State as Ohio the average working year is under 200 days. In 1917 the miners of New Mexico reached an average of 321 days, and in the largest field, the Raton field, it was actually 336—probably the record for steady operation.

This short year in coal-mine operation is due in part to seasonal fluctuation in demand. The mines averaged only 24 hours a week during the spring months. The weekly report of that date showed that 80 per cent of the lost time was due to "no market" and only 15 per cent to "labor shortage," while "car shortage" was a negligible factor. In contrast with this should be taken the last week before the strike, when the average hours operated were 39 and "no market" was a negligible item in lost time, while "car shortage" was by far the largest item. It follows that the short year is a source of loss to both operator and mine worker and is a tax on the consumer.[1]

[1] In spite of the strike order, effective the last day of the week, the production of soft coal during the seven days Oct. 26–Nov. 1 was greater than in any week this year save one. The exception was the preceding week, that of Oct. 25, which full reports now confirm as the record in the history of coal mining in the United States. The total production during the week ended Nov. 1 (including lignite and coal made into coke) is estimated at 12,142,000 net tons, an average per working day of 2,024,000 tons.

Indeed had it not been for the strike, curtailing the output of Saturday, the week of Nov. 1 would have far outstripped its predecessor. The extraordinary efforts made by the railroads to provide cars bore fruit in a rate of production during the first five days of the week which, if maintained for the 304 working days of full-time year, would yield 715,000,000 tons of coal. It is worth noting that this figure is almost identical with the 700,000,000 tons accepted early in 1918 by the Geological Survey and the Railroad Administration as representing the country's annual capacity. During these five days, therefore, the soft-coal mines were working close to actual capacity. There can be little doubt that the output on Monday, Oct. 27, was the largest ever attained in a single day. (U. S. Geol. Survey Bull.)

With substantially the same number of mines and miners working this year as last, the accumulative production for the first 10 months of this year is 100,000,000 tons less than that mined in the same period last year. This 25 per cent loss in output means that both plant and labor have been less productive, and, in terms of capital and labor, coal cost the Nation more this year than last. For in the long run both capital and labor require a living wage.

The public must accept responsibility for the coal industry and pay for carrying it on the year round. Mine operators and mine workers of whatever mines are necessary to meet the needs of the country must be paid for a year's work. The shorter the working year the less coal is mined per man and per dollar invested in plant, and eventually the higher priced must be the coal. It is obvious that the 264 short tons of coal mined by the average British miner last year could not be as cheap per ton as the 942 tons mined by the average American mine worker, backed up as he was with more efficient plant. (A proud contrast!)

It would clearly appear that the coal business may be stabilized, not wholly, but in a very large measure, in some of the western fields,[1] if the public does not regard its supply of coal as it does its supply of domestic water, which requires only that the faucet shall be opened to bring forth a gushing supply. Coal does not have pressure behind it which forces it out of the mine and into the coal yard. It rather must be drawn out by the suction of demand. And herein the public must play its part by keeping that demand as steady and uniform as possible.

HAVE WE TOO MANY MINES AND MINERS?

The problem of the miner and his industry may be stated in another way. We consume all the coal we produce. We produce it with labor that upon social and economic grounds works as a rule too few days in the year. We therefore must have a longer miners' year and fewer miners or a longer miners' year and additional markets. One or the other is inevitable unless we are to carry on the industry as a whole as an emergency industry, holding men ready for work when they are not needed in order that they may be ready for duty when the need arises. There are too many mines to keep all the miners employed all of the time or to give them a reasonable year's work. This conclusion is based on the assumption that we now produce only enough coal from all the mines to meet the country's demand, which is the fact. More coal produced would not sell more coal, but more coal demanded would result in greater

[1] It is the western and southern fields that are most affected by the seasonal demand. As a typical example, Illinois may be cited, with 18 per cent of the year's production in 25 per cent of the time, April, May, and June, in 1915, and 15 per cent in 1916. Retail dealers received 27 per cent of the coal from Illinois in the period from August, 1918, to February, 1919, compared with 4 per cent from the Pittsburgh, Pa., field.

coal production. With the full demand met by men working two-thirds or less of the time in the year there can not be a longer year given to all the miners without more demand for coal. This seems to be manifest. Therefore the miners must remain working but part time as now, or fewer miners must work more days, or market must be found for more coal and thus all the miners given a longer year. If we worked all of our miners in all of our mines a reasonable year, we would have a great overproduction. And to have all our mines work a longer period means that we must find some place in which to sell more coal, either at home or abroad.

Why have we so many mines working so many miners? There can be no one-word reply to this question. It penetrates into almost every social and economic condition of the country—the initiative of capital, the size of the country, the pride of localities, the intense competition between railroads, their inability to furnish cars when needed, the manner in which cars are apportioned between mines, the manner in which the railroads are operated so that movement is slow and equipment is short, and this runs into the need for new facilities, such as more yards, more tracks, more equipment, which brings us into the need for more capital and so on and on.

We have none too many mines or too many miners to supply our need if the mines are operated as at present. But we have too many to fill that need if they are operated on a basis nearer to 100 per cent of possible production.

THE LONG VIEW.

Passing from the labor phase of the coal situation to the larger aspect of our coal supply as related to the whole problem of the economical production of light, heat, and power, which Sir William Crookes has characterized as "first among the immediate practical problems of science," we find ourselves both rich and wasteful, following the primrose path, heedless of the morrow and not yet conscious that the morrow is to be a day of battle.

In the first place we treat coal as if it were a thing which was exclusively for home use, a nonexportable commodity which must be used "on the farm," whereas it should be treated with profound respect, because we know from Paris that sacred treaties and national boundaries turn on its presence. The world wants our coal, envies us for having it, fears us because of it. It is not only useful to us, but it has a cash value in the markets of the world. Therefore it should be saved.

In the next place we treat coal as if it were all alike, not selected by nature for specific uses; whereas we should choose our coal with as scientific a judgment as we choose our reading glasses. There is coal for coke and coal for furnaces and coal for house use and coal

adapted for one kind of boiler and a different kind of coal for a different kind of boiler. Therefore we should discriminate in coal.

And again we have shown little willingness to dignify coal by seeking to draw out by improved mechanical processes all the stored content of heat in this lump of carbon. Instead we content ourselves by giving it a mere pauper touch, driving off the greater volume of its value into the air. This is a task for the mechanical engineer.

Then, too, there is the problem of using coal in the form of steam or in the more exalted form of electric current. The lifting, bobbing lid of James Watt's teakettle did not speak the last word in power. We are only beginning to know how we may move on from one form of motive power to another. The wastefulness of steam power as contrasted with electric power is a real challenging problem in conservation by itself.

And then we naturally ask, Why this long haul over mountains and through tunnels and across bridges and along streets and into houses, by railroad, truck, and on the backs of men, when at the very pit mouth, or within the mine itself, this same coal might be transformed into electricity and by wire served into factories and homes 100, 200, 300 miles from the mine? Why burden our congested railroads with this traffic? Why strew our streets with this dirt? This may be a practicable thing, a wise thing; it deserves study if coal is worth conserving.

Are there no substitutes for coal which we can use and can not export? This question immediately raises the water-power possibilities of our land, of which only the most superficial study has been made. Sell coal and use electricity would appear a thrifty policy.

As petroleum is being used as a substitute for coal—and inasmuch as the whole problem of fuel supply is one—we are ultimately compelled to an investigation of the ability of our petroleum supply to meet its present drain and to meet the expansion in its use, which is the most surprising development of our day in the study of power creation.

This spells a program of development and conservation which should challenge the ambitions of this Nation, and on a few of its features perhaps a few further words would be justified.

SAVING COAL.

The two ways by which coal in greatest volume can be saved are the discovery of the method by which more power can be taken from the ton and the discovery of what kind of coal is best fitted for any particular use.

It has been everyone's business to save coal, hence . . . . . The railroads have experimented with some success. They get perhaps 10 per

cent of the heat energy from a ton shoveled beneath the locomotive boiler, 10 per cent of the total in the ton. They use one-quarter of all the coal mined. Next to labor this is the greatest expense which our railroads have. This shows how great the problem is to them. Some have adopted a system of paying a bonus for the greatest distance made on a given quantity of a given coal. But this laudable effort has not met with the cooperation that would be expected from the firemen, for reasons that go far afield. Industries, especially those which generate electric power, have made similar effort to gain from their fuel its greatest potentiality, and with varying success. We can overlook the stoking of the domestic furnace as a national concern, for the amount of coal used in this way amounts to not more than 17 per cent of the national coal bill, and this whole charge could be saved, it is estimated, by giving care to the 75 per cent of our coal which is burned under boilers to make steam. Here there is a maximum figure of 13 per cent of the energy of the coal put into harness, and the average is less than 10 per cent, even in the larger plants.

In one establishment visited by the fuel engineers of this department during the war a preventable waste of 40,000 tons a year was discovered. By changes in the admission of air to the furnaces and in the "baffling" of the boilers the engineers of the Bureau of Mines are confident that they have been able to increase the economy of coal in the ships of the Emergency Fleet Corporation by 16 per cent, making 6 pounds of coal do the work of 7. If such a percentage of economy could be generally effected it would mean the saving of as much coal as France and Italy together will need in this year of their greatest distress.

COAL AND COAL.

The Government should sample and certify coal. We do this as to wheat and meat; it is just as necessary to avoid injustice in the case of coal, and it is thoroughly practicable. The public should know the kind of coal it is buying, because it should buy the coal it needs. There need be no prohibition against the mining or selling of any coal,[1] but coal should sell in terms of its capacity to de-

[1] In every trainload of coal hauled from the mines to our coal bins, 1 carload out of every 5 is going nowhere. In a train of 40 cars, the last 8 are dead load that might better have been left in the bowels of the earth. No less an authority than Martin A. Rooney states: "Every fifth shovel full of coal that the average fireman throws into his furnace serves no more useful purpose than to decorate the atmosphere with a long black stream of precious soot. At best one-fifth of all our coal is wasted."

The first requisite toward effecting fuel economy is to secure cooperation between owners, managers, and the men who fire the coal. Mechanical devices to increase efficiency in the use of coal can not produce satisfactory results unless the operators who handle them are impressed with the importance of their duties.

It is not essential for the plant manager to be a fuel expert, but he should be familiar with the instruments that give a check on the daily operations. It is a mistake not to provide proper instruments, for they guide the firemen and show the management what

liver heat. Some coal that is only a pint bottle is selling as a quart bottle. And the quart is hurt by the competition of the pint. A bill to effect such fuel inspection has been drafted and will be presented to Congress. It is not a bill commanding anything, but rather gives to those who are willing an opportunity to have their product inspected and attested and thus acquire merit in the eye of the world as against those who are not willing to subject their coal to the official test tube. Coal is coal in the sense of the classic traffic classification. Coal is, however, not always coal, nor is it altogether coal when put to the pragmatic test of the furnace. If such a bill were passed it would promote the interests of those who schedule their price upon the merit of their goods and make against the hauling of slate and dirt, its storage and handling under an assumed name. The plan is not to punish the malefactor who attempts to impose upon the public a slender number of thermal units as a ton of coal, but rather to give to ever man an opportunity to advertise the number of such units which his particular article contains, thus enabling the injured public to strike against an unfair mine.

Furthermore we are to become great exporters of coal, unless all signs fail, and such certification should be required as to every ton sent abroad.

EXPANSION ABROAD.

It has been said that we have too many mines in operation, as we appear to have too many miners, if we are to maintain only our present output. Rapid expansion in the development of industry in general may justify the existence of such mines and so large a corps of workers, even with an adequate car supply and more abundant local storage facilities, which are greatly needed in almost all places, and a more even demand. If, however, this should not be so, there is a foreign demand for the best of our bituminous coals, which at present we are altogether unable to meet for lack of credits on the part of those who wish the coal, and lack of ships to carry it. England's annual production has fallen 100,000,000 tons, according to

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has taken place daily. Instruments provided for the boiler room manifest the interest taken by the management toward conserving fuel. It indicates cooperation and encourages the firemen to work harder to increase the efficiency.

A second factor effecting fuel economy is the selection of fuel for the particular plant. It is not expected of a plant manager that he should be thoroughly informed as to the character of all fuels; but he can enlist the services of a man who is thoroughly trained in this field. The Bureau of Mines has compiled valuable information on the character and analyses of coal from almost every field in the United States. Information concerning the character and chemical constituents of the coal, together with knowledge pertaining to the equipment of the plant, makes it possible to select a fuel adapted to the equipment, thereby insuring better combustion. Hundreds of boiler plants operate at no greater than 60 per cent efficiency, and it would be a comparatively simple matter to bring them up to 70 per cent efficiency. The saving in tonnage would be more than the combined yearly coal-carrying capacity of the Baltimore & Ohio and the Southern Railway systems. The direct saving to our industries at $5 per ton would amount to $200,000,000 worth of coal per year.

Mr. Hoover, and the European demand next year will be more than 150,000,000 tons above her production. Whatever the world need, it can not be supplied. It is too large for any possible supply by ship, even if all necessary financial arrangements could be made, either by loan or credit. Europe, indeed, will sadly learn through this winter how little coal she can live on and how more than perilous is the state of a people who are short of power, light, and heat.

As this country prior to the war sold abroad no more than 4,500,000 tons as against England's 77,000,000, it is quite manifest that here will be a new field for American enterprise, the enterprise being needed not for the winning of markets as much as for finding ways of dealing with the larger phases of a heavy overseas trade with those who are without immediate resources.

SAVING COAL BY SAVING ELECTRICITY.

It is three years since Congress was urged that we should be empowered to make a study of the power possibilities of the congested industrial part of the Atlantic seaboard, with a view to developing not only the fact that there could be effected a great saving in power and a much larger actual use secured out of that now produced, but also that new supplies could be obtained both from running water and from the conversion of coal at the mines instead of after a long rail haul. A stream of power paralleling the Atlantic from Richmond to Boston, a main channel into which run many minor feeding streams and from which diverge an infinite number of small delivering lines—the whole an interlocking system that would take from the coal mine and the railroad a part of their present burden and insure the operation of street lights, street cars, elevators, and essential industries in the face of railroad delinquencies—this is the dream of our engineers, and a very possible dream it has seemed to me; of such value, indeed, that we might well spend a few thousand dollars in studying it, not with the thought that the Government would construct or operate even the trunk line, but that it might so attract the attention of the engineering and financial world as to make it a reality.

To tie together the separated power plants of 10 States so that one can give aid to the other, so that one can take the place of the other, so that all may join their power for good in any great drive that may be projected—this would be the prime purpose of the plan; and from this would evolve the development of the most practicable method of supplying this vast interdependent system with more power—perhaps from the conversion of coal, as it drops from the very tipple, using the mine as one might use a waterfall, or by the development of great hydroelectric plants on the many streams from the Androscoggin to the James.

WHITE COAL AND BLACK.

This would be a plan for the wedding of the stream and the mine, the white coal with the black. "White coal" they call it in imaginative France, this tumbling water which is converted into so many forms; and a much cleaner, handier kind of coal it is than its black brother. And cheaper, for the water goes on to return again and fall once more and forever into the pockets of the turbine which whirls the dynamo and so gathers or releases that mystery which we name but never define. Farsighted, purposeful Germany fought four and a half years upon the strength of great power plants run by the snows of the Alps. She did not rely on these alone for power, nor were they her main reliance, but they gave her a lasting power which otherwise she would not have had. And we may expect her to improve on that war-time experience for the conduct of the hard fight she is to make in the industrial field. France saved enough territory from the invader to permit her to make new adventures into this field and so to some degree offset the coal loss of Lens. Italy found that she had still left unused opportunities for hydroelectric development sufficient with the coal she could secure from England and America to see her through the war. And with coal conditions as they are in Europe we may expect a still greater push to make use of water power to turn the industrial wheels of peace. It must be so likewise here.

And it is likely that the long-pending power bill which will make available the dam and reservoir sites on withdrawn public lands and make feasible the financing of many projects on both navigable and unnavigable streams will soon have become law. We shall then have an opportunity that never before has been given us to develop the hydroelectric possibilities of the country. And this raises the question as to their extent.

The theoretical maximum quantity of hydroelectric power that can be produced in the United States has recently been estimated by Dr. Steinmetz, who calculates that if every stream could be fully utilized throughout its length at all seasons, the power obtained would be 230,000,000 kilowatts (320,000,000 horsepower). It is clear that only a fraction of this absolute maximum can ever be made available. The Geological Survey estimates that the water power in this country that is available for ultimate development amounts to 54,000,000 continuous horsepower.

The census of 1912 showed that the country's developed water power was 4,870,000 horsepower, about 9 per cent of the maximum power available for economic development and less than 2 per cent of the total that may be supplied by the streams as estimated by Dr. Steinmetz. According to the census, stationary prime movers representing a capacity of more than 30,000,000 horsepower, fur-

nished by water, steam, and gas, were in operation in the United States in 1912. (This amount does not, of course, include power generated by locomotives, marine engines, automobiles, and similar mobile apparatus.) The average power furnished by these stationary prime movers was probably not more than 20 per cent of their installed capacity, so that the power produced in 1912 was equivalent to probably not more than 6,000,000 continuous horsepower.

As the estimated available water power given above represents continuous power the country evidently possesses much more water power than it now requires, so that there would be an ample surplus for many years if the power were so distributed geographically that it could be economically supplied to the industries that need it. But as a matter of fact the water-power resources of the country are by no means evenly distributed. Over 70 per cent of the available water power is west of the Mississippi, whereas over 70 per cent of the total horsepower now installed in prime movers is east of the river. Therefore unless the East is to lose its industrial supremacy it must press and press hard for the development of all water-power possibilities!

THE AGE OF PETROLEUM.

For a full century now we have been passing through different phases of industrial and commercial life which have been characterized by some form of power. First the age of steam, and then the age of electricity. We have passed out of neither and yet we have come into another age—that of petroleum. As a lubricant, it has become of such universal use that it has been called the barometer of industry, and no doubt after it has ceased to be a popular illuminant or a source of power it will live invaluable as the thing which lets the wheels go round. Its greatest popularity now arises out of its use in the internal-combustion engine, and of the making of these there is no end. It draws railroad trains and drives street cars. It pumps water, lifts heavy loads, has taken the place of millions of horses, and in 20 years has become a farming, industrial, business, and social necessity. The naval and the merchant ships of this country and of England are fitted and being fitted to use it either under steam boilers as fuel or directly in the Diesel engine. The airplane has been made possible by it. It propels that modern juggernaut, the tank. In the air it has no rival, while on land and sea it threatens the supremacy of its rivals whenever it appears. There has been no such magician since the day of Aladdin as this drop of mineral oil. Medicines and dyes and high explosives are distilled from it. No one knows whence it cometh or whither it goeth. Men search for it with the passion of the early Argonauts, and the promise now is that nations will yet fight to gain the fitful bed in which it lies.

In Persia and in Palestine, in Java and in China, in southern Russia and in Rumania we know that petroleum is, for it has been found there. How great these fields or others in Europe, Asia, or Africa may be no one would dare to say. As yet, however, the petroleum of the world has come from this hemisphere.

The "oil spring" which George Washington found in western Virginia and by his last will called to the especial consideration of his trustees was the promise of a continental well which last year yielded 356,000,000 barrels. Each year has seen the prophecy unfulfilled that the peak of the possible yield had been reached.

From the mountains of western Pennsylvania into the very ocean bed of the Pacific and even beyond and into the broken strata of upturned Alaska, the oil prospector bored with his sharp tooth of steel and found oil. Hardly has one field fallen into a decline when another has come rushing into service. Only three years ago and all hopes were centered in Oklahoma, and then came Kansas, and then the turn went south again to Texas, and now it looks toward Louisiana. Geologists have estimated and estimated, and they do not differ widely, for few give more than thirty years of life to the petroleum sands of this country if the present yield is insisted upon. And yet there is so much of mystery in the hiding of this strange subterranean liquid that honest men will not say but that it will become a permanent factor in the world of light, heat, and power. If this is not so we are a fatuous people, for with every fifth man in the country the owner of an automobile and the expenditure of hundreds of millions of dollars for roads fit only for their use, and with ships by the hundred specially constructed to burn oil, we have surely given a large fortune in pledge of our faith that our pools of petroleum will not soon be drained dry, or that others elsewhere will come to our help.

In 1908 the country's production of oil was 178,500,000 barrels, and there was a surplus above consumption of more than 20,000,000 barrels available to go into storage. In 1918, 10 years later, the oil wells of the United States yielded 356,000,000 barrels—nearly twice the yield of 1908—but to meet the demands of the increased consumption more than 24,000,000 barrels had to be drawn from storage. The annual fuel-oil consumption of the railroads alone has increased from 16⅔ to 36¾ million barrels; the annual gasoline production from 540,000,000 gallons in 1909 to 3,500,000,000 gallons in 1918. This reference to the record of the past may be taken not only as justifying the earlier appeal for Federal action, but as warranting deliberate attention to the oil problem of to-day.

Fuel oil, gasoline, lubricating oil—for these three essentials are there no practical substitutes or other adequate sources? The obvious answer is in terms of cost; the real answer is in terms of man power. Whether on land or sea, fuel oil is preferred to coal because it re-

quires fewer firemen, and back of that, in the man power required in its mining, preparation, and transportation the advantage on the side of oil is even greater. So, too, the substitute for gasoline in internal-combustion engines, whether alcohol or benzol, means higher cost and larger expenditure of labor in its production.

There are large bodies of public land now withdrawn, which, under the new leasing bill which seems so near to final passage after seven years of struggle and baffled hope, will in all likelihood make a further rich contribution to the American supply.

OIL SHALE.

And beyond these in point of time lie the vast deposits of oil shale which by a comparatively cheap refining process can be made to yield vastly more oil than has yet been found in pools or sands. The value of this oil shale will depend upon the cheapness of its reduction, and this must be greatly lessened by the value of by-products before it can compete with coal or the oil from wells. There is every reason to believe, however, that some day the production of oil from shale will be a great and a permanent industry. And the country could make no better immediate investment than to give a large appropriation for the development of an economical shale-reducing plant.

So conservative an authority as the Geological Survey estimates that the oil shales of the Western States alone contain many times over the quantity of oil that will be recovered from our oil wells. The retorting of oil from oil shale has been a commercial industry for many years in Scotland and France; in fact, oil was obtained from oil shale here in the United States before the first oil well was drilled. The industry is in process of redevelopment to-day and if successful will assure us of a future supply, but at the best it will take years of time and a vast investment of capital to build up the industry to such a point that it can supply any considerable proportion of our needs. It is imperative, however, that the development of this latent resource be furthered and brought to a state of commercial development as soon as possible.

SAVE OIL.

Yet with all the optimism that can be justified I would urge a policy of saving as to petroleum that should be rigid in the extreme. If we are to long enjoy the benefits of a petroleum age, which we must frankly admit fits into the comfort-loving and the speed-loving side of the American nature, we must save this oil.

We must save it before it leaves the well; keep it from being lost; keep it from being flooded out, driven away by water. Through the cementing of wells in the Cushing field, Oklahoma, the daily volume of water lifted from the wells was decreased from 7,520 barrels to 628 barrels, while the daily volume of oil produced was increased

from 412 barrels to 4,716. These instances show what can and should be done in our known oil fields.

We must save the oil after it leaves the well, save it from draining off and sinking into the soil, save it from leaking away at pipe joinings, save it from the wastes of imperfect storage.

Then we come to the refining of the oil. How welcome now would be the knowledge that we could recover what was thrown away when kerosene was petroleum's one great fraction. (The loss in refineries is still startling, some 14,556,000 barrels last year—4½ per cent of the crude run in the refineries.)

The self-interest of the American refiner, notably the Standard Oil Co., has done a work that probably no mere scientific or noncommercial impulse could have equaled, in torturing out of petroleum the secrets of its inmost nature. And yet the thought will not altogether give place that in that residue which goes to the making of roads or to be burned in some crude way there may be things chemical that will work largely for man's betterment. This is the fact, too—that where the oil is produced by some small companies which have not the financial ability to make it yield its full riches there is a greater danger of loss of this kind. It would be well indeed if there could be such regulation as would require that all petroleum must be refined. That this is done generally is not denied. It should be universal. And all the skill and study and knowledge of the ablest of chemists and mechanicians should find themselves challenged by the problem of petroleum.

Coming to the use of petroleum in its various forms we find a field of promise. The engine that doubles the number of miles that can be made on a gallon of gasoline doubles our supply. There is where we can apply the principle of true conservation—find how little you need; use what you must, but treat your resource with respect. Has the last word been said as to the carburetor? Mechanical engineers do not think so. Have all possible mixtures which will save oil and substitute cheaper and less rare combustibles therefor been tried? Men by the hundred are making these experiments, and almost daily the quack or the stock promoter comes forward with the announcement of a discovery which proves to be a revelation—a revelation of human stupidity or criminal cupidity. On this line the men of science do not sing a song of the richest hope; they shrug their shoulders, exclaiming with uplifted hands: "Well, may be, may be."

There are possible substitutes for some petroleum products, but not for the whole barrel of oil; furthermore, petroleum is the cheapest material, speaking quantitatively, from which liquid fuels and lubricants can be made; therefore, any substitutes obtained in quantity must cost more. Alcohol can be substituted for gasoline, but

only in limited quantity and at increased cost. Benzol from by-product coking ovens also can be used, but quantitatively is totally inadequate. For kerosene no quantitative substitute is known. Lubricants can be obtained from animal and vegetable fats, but mostly are inferior in quality, and there seems no hope of obtaining them in quantity. Fuel oil can be largely supplanted by coal, but for the internal-combustion engine there is no quantitative substitute.

USE THE DIESEL ENGINE.

We have ventured on a great shipbuilding program. Our people are to once again respond to the call of the sea. On private ways and on Government ways ships are being built to go round the world—ships that are to burn oil under boilers and produce steam. I presume that there is a justification for this policy, perhaps one that is as good, if not better, than can be made for the railroads of the West pursuing the same policy. I submit, however, that there should be justification shown for the construction of any oil-burning ship which does not use an engine of the Diesel type. To burn oil under a boiler and convert it into steam releases but 10 per cent of the thermal units in the oil, whereas if this same fuel oil were used directly in a Diesel engine, 30 to 35 per cent of the power in the oil would be secured. Substitute the internal-combustion engine for the steam boiler and we multiply by three or three and one-half the supply of fuel oil in the United States. Instead of our fuel-oil supply being, let us say, 200,000,000 barrels, it would at once rise to 600,000,000 barrels or 700,000,000. I recognize that this is an impractical and unrealizable hope as applied to things as they are, but there is no reason why this should not be a very definite policy as to things that are to be.

This Government might itself well undertake to develop an engine of this type for use on its ships, tractors, and trucks. We simply can not afford to preach economy in oil when we do not promote by every means the use of the internal-combustion engine for its consumption. No other one thing that can be done by the Government, our industries, or the people will save as much oil from being wasted and thereby multiply the real production of the United States. If such engines are delicate of handling and need specially trained engineers, which appears to be the fact, there should be little difficulty experienced in training men for such work. A nation that could educate 10,000 automobile mechanics in 60 days might indeed develop 1,000 Diesel engineers in a year. The matter is of too great moment for delay. It touches the interest of everyone. We are in the petroleum age, and how long it will last depends upon our own foresight, inventiveness, and wisdom.

WANTED—A FOREIGN SUPPLY.

Already we are importers of petroleum. We are to be larger importers year by year if we continue—and we will—to invent and build machines which will rely upon oil or its derivatives as fuel. Our business methods have been and doubtless will continue to be developed along lines that make a continuing oil supply a necessity. Some of that oil must come from abroad, as nearly 40,000,000 barrels did last year, and for that we must compete with the world. For while we are the discoverers of oil and of the methods of securing it and refining it, piping it, and using it, our pioneering is but a service unto the world.

This situation calls for a policy prompt, determined, and looking many years ahead. For the American Navy and the American merchant marine and American trade abroad must depend to some extent upon our being able to secure, not merely for to-day but for to-morrow as well, an equal opportunity with other nations to gain a petroleum supply from the fields of the world. We are now in the world and of it in every possible sense, otherwise our Navy and our merchant fleet would have no excuse. No one needs to justify them—they are the expression of an ambition that carries no danger to any people. For their support we can ask no preference, but in their maintenance we can insist that they shall not be discriminated against.

Sometime since I presented to a board of geologists, engineers, and economists in this department this question:

If in the next five years there should develop a new demand for petroleum over and above that now existing, which would amount to 100,000,000 barrels a year, where could such a supply be found, and what policy should be adopted to secure it?

The conclusions of this board may be summarized as follows:

(1) Such an oil need could not be met from domestic sources of supply.

(2) It could not be assured unless equal opportunities were given our nationals for commercial development of foreign oils.

(3) Assurance of this oil supply therefore inevitably entails political as well as commercial competition with other nationals, as other nationals controlling foreign sources of supply have adopted policies that discriminate against, hinder, and even prevent our nationals entering foreign fields.

(4) The encouragement of and effective assistance to our nationals in developing foreign fields is essential to securing the oil needed.

(5) Commercial control by our nationals over large foreign sources of supply will be essential if the estimated requirements are to be assured.

(6) It is necessary that all countries be induced to abandon or adequately modify present discriminatory policies and that the interest of our nationals be protected.

(7) Some form of world-wide oil-producing, purchasing, and marketing agency fostered by this Government seems essential to assure the commercial control over sufficient resources to meet the competition of other nationals. England has apparently adopted such a policy.

This board proposed the following program of action:

(1) To secure the removal of all discriminations to the end that our nationals may enjoy in other countries all the privileges now enjoyed by other nationals in ours:

(*a*) By appropriate diplomatic and trade measures.

(*b*) By securing equal rights to our nationals in countries newly organized as mandatories.

(2) To encourage our nationals to acquire, develop, and market oil in foreign countries:

(*a*) By assured adequate protection of our citizens engaged in securing and developing foreign oil fields.

(*b*) By promotion of syndication of our nationals engaged in foreign business, in order to effectually conduct oil development and distribution of petroleum and its products abroad.

(3) Governmental action—through special agency or board:

(*a*) Through the organization of a subsidiary governmental corporation with power to produce, purchase, refine, transport, store, and market oil and oil products.

(*b*) Through the formation of a permanent petroleum administration.

(4) To assure to our nationals the exclusive opportunity to explore, develop, and market the oil resources of the Philippine Islands, provided discriminatory policies of other nations against our nationals are not abandoned or satisfactorily modified.

I have given much thought during the past year to this problem of adding to our petroleum supply, and it has seemed to me but fair that we should first make every effort to increase the domestic supply through the methods that have been indicated—

(1) The saving of that which is now wasted, below ground and above ground.

(2) The more intensive use, through new machinery and devices, of the supply which we have.

(3) The development of oil fields on our withdrawn territory and in new areas such as the Philippines.

In addition, we must look abroad for a supplemental supply, and this may be secured through American enterprise if we do these things:

(1) Assure American capital that if it goes into a foreign country and secures the right to drill for oil on a legal and fair basis (all of which must be shown to the State Department) that it will be protected against confiscation or discrimination. This should be a known, published policy.

(2) Require every American corporation producing oil in a foreign country to take out a Federal charter for such enterprise under which whatever oil it produces should be subject to a preferential right on the part of this Government to take all of its supply or a percentage thereof at any time on payment of the market price.

(3) Sell no oil to a vessel carrying a charter from any foreign government either at an American port or at any American bunker

when that government does not sell oil at a nondiscriminatory price to our vessels at its bunkers or ports.

The oil industry is more distinctively American than any other of the great basic industries. It has been the creation of no one class or group but of many men of many kinds—the hardy, keen-eyed prospector with a "nose for oil" who spent his months upon the deserts and in the mountains searching for seepages and tracing them to their source; the rough and two-fisted driller, a man generally of unusual physical strength, who handled the great tools of his trade; the venturesome "wildcatter," part prospector, part promoter, part operator, the "marine" of the industry, "soldier and sailor too"; the geologist who through his study of the anatomy of the earth crust could map the pools and sands almost as if he saw them; the inventor; the chemist with still and furnace; the genius who found that oil would run in a pipe—these and many more, in most of the sciences and in nearly all of the crafts, have created this American industry. If they are permitted they will reveal the world supply of oil. And upon that supply the industries of our country will come to be increasingly dependent year by year.

BY WAY OF SUMMARY.

It would seem to be our plain duty to discover how little coal we need to use. To do this we must dignify coal by grading it in terms not merely of convenience as to size, but in terms of service as to its power. We should save it, if for no better reason than that we may sell it to a coal-hungry world. We should develop water power as an inexhaustible substitute for coal and if necessary compel the coordination of all power plants which serve a common territory. New petroleum supplies have become a national necessity, so quickly have we adapted ourselves to this new fuel and so extravagantly have we given ourselves over to its adaptability. To save that we may use abundantly, to develop that we may never be weak, to bring together into greater effectiveness all power possibilities—these would seem to be national duties, dictated by a large self-interest.

I have gone only sufficiently far into this whole question to realize that it is as fundamental and of as deep public concern as the railroad question and that it is even more complex. No one, so far as I can learn, has mastered all of its various phases; in fact, there are few who know even one sector of the great battle front of power. A Foch is needed, one in whom would center a knowledge of all the activities and the inactivities of these three great industries, which in reality are but a single industry. We should know more than we do, far more about the ways and means by which our unequaled wealth in all three divisions can be used and made interdependent, and the moral and the legal strength of the Nation should be behind a studied, fact-based, long-viewed plan to make America the

home of the cheapest and the most abundant and the most immediately and intimately serviceable power supply in the world. If we do this, we can release labor and lighten nearly every task. We will not need to send the call to other countries for men, and we can distribute our industries in parts of the country where labor is less abundant and where homes will take the place of tenements. One could expand upon the benefits that would come to this land if a rounded program such as has been but skeletonized here could be carried out. I am convinced that within a generation it will be effected, because it will be necessary.

The simple steps now obviously needed are to pass those primary bills which are already before Congress or are here suggested. But beyond this there is imperative need that some one man (an assistant secretary in this department would serve)—some one man with a competent staff and commanding all the resources of this and other departments of the Government shall be given the task of taking a world view as well as a national view of this whole involved and growing problem, that he may recommend policies and induce activities and promote cooperative relationships which will effect the most economical production of light, heat, and power, which is more than the first among the immediate practical problems of science, as Sir William Crookes said, for it is foremost among the immediate practical problems of national and international statesmanship.

LAND DEVELOPMENT.

I wish now to ask consideration for another matter of home concern to which I gave attention in my last report and as to which the intervening year has strengthened and perhaps broadened my ideas—the development of our unused lands.

It was never more vital to the welfare of our people that a creative and out-reaching plan of developing and utilizing our natural resources should go bravely forward than it is to-day. Ours is a growing country, and as its social and industrial superstructure expands its agricultural foundation must be broadened in proportion. The normal growth of the United States now requires an addition of 6,300,000 acres to its cultivable area each year, which means an average increase of 17,000 acres a day.

Fortunately, the opportunity for this essential expansion exists not only in the West, where much of the public domain is yet unoccupied, but in every part of the Republic. We have a great fund of natural resources in the very oldest States, from Maine to Louisiana, which invite and would richly reward the constructive genius of the Nation. It is claimed by those who have specialized for years on the subject of reclamation that the control and utilization of flood waters now wasted would produce within the next 10 years more

wealth than the entire cost to the United States of the war with Germany.

After every other war in our history the work of internal development has gone forward by leaps and bounds, and our people have thus quickly made good the economic wastes of the conflict. The needs of to-day are different from those of the past and require different treatment, but they are by no means beyond the reach of enlightened thought and action.

More than a year ago we began an earnest discussion of reconstruction policies, particularly with respect to the land. But nothing has been done. Not one line of legislation, not one dollar of money has been provided except in the way of preliminary investigation. We stand voiceless in the presence of opportunity and idle in the face of urgent national need.

A PROGRAM OF PROGRESS.

The great work of material development accomplished in the past has been done very largely by private capital and enterprise. Doubtless this must be the chief reliance for progress in the future. We should realize, however, that this method has involved losses as well as gains, for the Nation has sometimes been too prodigal in offering its natural resources as an inducement to private effort. Not only so, but with the exhaustion of the free public lands in our great central valleys—the most remarkable natural heritage that ever fell into the lap of a young nation—conditions of home making and settlement have radically changed.

There can be do doubt that there is an important sphere of action which the Government must occupy if we are to go steadily forward with the work of continental conquest, and all it implies to the future of the Nation, but in suggesting practicable steps of progress at this time I do not forget the burden of taxation which confronts our people nor the delicate and difficult task which Congress is called upon to perform in trying to keep the national outgo within the national income. Hence, I am now suggesting such constructive things as the Government may be able to do through the exercise of its powers of supervision and direction and with the smallest possible outlay of money.

Under this head I put, first, the matter of suburban homes for wage earners; second, reclamation of desert, overflow, and cut-over areas, together with improvement of abandoned farms, under a system of district organization which may be made to finance itself; third, cooperation with various States in the work of internal development.

GARDEN HOMES FOR THE PEOPLE.

There is no more baffling problem than that presented by the continued growth of great cities, but it is a problem with which we must

sometime deal. It bears directly on the high cost of living and is, indeed, largely responsible for it. Rent is based on land values. Land values rise with increasing population. The price of food is closely related to the growing disproportion between consumers and producers, resulting from urban congestion.

Here is Washington, a city of some 400,000 people, doubtless destined steadily to grow until—a Member of Congress predicts—it may touch 2,000,000 twenty years hence. Already the housing problem is acute, as it is in almost every other large American city. It would be a pitiful thing if the provision of more housing facilities to meet the needs of growing population meant merely more congestion and higher rents, with an ever-decreasing degree of landed proprietorship and true individual independence. Such conditions, it seems to me, undermine the American hearthstone and carry a deep menace to the future of our institutions. I believe there must be a better way, and that the time has come when we should make an earnest effort to find it.

Within a 10-mile circle drawn around the Capitol dome are thousands of acres of good agricultural land, of which the merest fraction has been reduced to intensive cultivation. Much of it is wastefully used, and much of it is not used at all. Conditions of soil, climate, and water supply are good and represent a fair average for the United States. Suburban transportation is a serious problem in some localities and less so in others, but tends to become more simple with the extension of good roads and increasing use of motor vehicles, including the auto bus.

Somewhere and sometime, it seems to me, a new system must be devised to disperse the people of great cities on the vacant lands surrounding them, to give the masses a real hold upon the soil, and to replace the apartment house with the home in a garden. Such a system should enable the ambitious and thrifty family not only to save the entire cost of rent, but possibly half the cost of food, while at the same time enhancing its standard of living socially and spiritually, as well as economically.

It has been suggested that there is no better place to demonstrate a new form of suburban life than here at the National Capital, where we may freely draw upon all the resources of the governmental departments for expert knowledge and advice and where the demonstration can readily command wide publicity and come under the observation of the Nation's lawmakers. And I am expecting that this experiment will be made. Such a plan of town or community life, rather than city life, should be extended to every other large city in the Nation. A simple act of legislation, accompanied by a moderate appropriation for organization and educational work, would enable the department to put its facilities at the service of local communities and of the industries throughout the United

States. This form of national leadership would be of value both to investors in the local securities and to the home builders themselves. If the work of land acquisition and construction, together with the organization of community settlements resulting therefrom, were conducted under the supervision of the State or the Federal Government it would safeguard the character of the movement from every point of view.

Therefore, I put first among the constructive things which may be done by the exercise of the Government's power of supervision and direction, with the smallest outlay of money, this matter of providing suburban homes for our millions of wage earners.

RECLAMATION BY DISTRICT ORGANIZATION.

The provision of garden homes for millions of city workers will contribute largely to the Nation's food supply and become in time a most effective influence in reducing excessive cost of living for many of our people. It will not, of course, solve the problem of increasing the number of farms and the area of cultivation to meet the needs of growing population. Neither will it enable us to expand our home market rapidly and largely enough to keep the country on an even keel of prosperity.

We must go forward with the development of natural resources as we have done for the past three centuries. And we must recognize at the outset that conditions have changed with the depletion of the public domain to the point where it offers comparatively little in the way of cultivable lands.

We have now to deal principally with lands in private ownership. This calls for a new point of view and for the application of a somewhat different principle than that which has governed our reclamation policy heretofore. Moreover, reclamation is no longer an affair of one section of the United States. The day has come when it must be nationalized and extended to all parts of the Republic.

To the deserts of the West we have brought the creative touch of water, and we must find a way to go on with this work. But it is of equal importance that we should liberate rich areas now held in bondage by the swamp, convert millions of acres of idle cut-over lands to profitable use, and raise from the dead the once vigorous agricultural life of our abandoned farms.

One more fundamental consideration—we have outlived our day of small things. Whether we would or not, we are compelled by the inexorable law of necessity arising out of existing physical conditions to cooperate, to work together, and to employ large-scale operations, and on this principle we should move: Not what the Government can do for the people, but what the people can do for themselves under the intelligent and kindly leadership of the Government.

We have an instrument at hand in the Reclamation Service which has dealt with every phase of the problem which now confronts us, and with such high average success as to command the entire confidence of Congress and the country. It has turned rivers out of their natural beds, reared the highest dams in existence, transported water long distances by every form of canal, conduit, and tunnel, installed electric power plants, cleared land, provided drainage systems, constructed highways and even railroads, platted townsites, and erected buildings of various sorts. In this experience, obtained under a variety of physical and climatic conditions, it has developed a body of trained men equal to any constructive task which may be assigned to it in connection with reclamation and settlement in any part of the country.

True economic reclamation is a process of converting liabilities into assets—of transforming dormant natural resources into agencies of living production. When such a process is intelligently applied it should be able to pay its own bills without placing fresh burdens on the national treasury. It is in the confident belief that such is actually the case that I suggest the policy of reclamation by means of local districts, financed on the basis of their own credit but with the fullest measure of encouragement and moral support of the Government, practically expressed through the Reclamation Service.

In this connection it seems worth while to recall that with a net expenditure of $119,000,000 the Reclamation Service has created taxable values of $500,000,000 in the States where it has operated. The ratio is better than three to one, and that is a wider margin of security than is usually demanded by the most conservative banking methods. There is no reason to doubt that the overflow lands of the South, the cut-over areas of the Northwest, and the abandoned farm districts of New England and New York and other States would do quite as well as the deserts of the West if handled by such an organization.

What is the legitimate function of the Government in connection with reclamation districts to be financed entirely upon their own credits without the aid of national appropriations? I should say that the Government, with great advantage to the investor, the landowner, the future settler, and the general public, might do these things:

1. Employ its trained, experienced engineers, attorneys, and economists in making a thorough investigation of all the factors involved in a given situation, to be followed by a thorough official report upon the district proposed to be formed.

2. Offer the district securities for public subscription in the open market. This, of course, would follow the actual organization of the

district and the approval of its proceedings by the Government's legal experts.

3. Construct the works of reclamation with proceeds of district bond sales, and administer the system until it becomes a "going concern," when it may be safely confided to its local officers.

The most obvious advantage of Government cooperation is the fact that it would assure the service of a body of engineers, builders, and administrators trained in the actual work of reclamation. This advantage, as compared with the management that might be had in a sparsely settled local district, would often make all the difference between success and failure. Unquestionably it would materially reduce the interest rate on district bonds and greatly facilitate their sale in the open market.

There are other advantages less obvious but really more important. Experience has shown that great enterprises can best be handled under centralized control. This control, to be effective, must extend from the initiation to the completion of the project. There can be no assurance of this when the management is left to the electorate of a local district, and without such assurance it is difficult to command the support, first, of the landowners whose consent is essential to the formation of the district; next, of the investors who must supply the money; finally, of the settlers who must purchase and develop the land in order that the object of the enterprise may be realized. The Government can give the assurance of precisely that quality of unified, centralized, permanent, and responsible control that is required to command the confidence of all the factors in the situation.

There is another advantage of Government cooperation that will inure greatly to the benefit of the settler. The Government may readily apply the policy it now uses in connection with privately owned lands within reclamation projects. It requires the owners to enter into a contract by which they agree to accept a certain maximum price for their land if sold within a given period of years. This price is based upon the value of the land before reclamation. There are many instances, particularly of swamp and cut-over areas, where land that may be bought for $10 an acre and reclaimed at a cost of $25 to $50 per acre, has an actual market value of $100 to $200 per acre the moment it is put into shape for cultivation. If the Government, by means of a contract with the local district, undertakes the work of reclamation and settlement and does this work at actual cost, the settler will generally save enough to pay for all his improvements and equipment.

The crowning consideration is the fact that, because of all these advantages, the work of reclamation would actually be accomplished, while to-day it is not being done except in the far West, and accomplished without the aid of Government appropriations.

SOLDIER-SETTLEMENT LEGISLATION.

In the foregoing, attention has been called to those things which may be accomplished by the exercise of the Government's powers of supervision and direction with the smallest outlay of money. In all this I have been speaking of reclamation for the sake of reclamation.

The proposed soldier-settlement legislation stands on an entirely different footing. The primary object is not to reclaim land but to reward our returned soldiers with the opportunity to obtain employment and larger interest in the proprietorship of the country. The policy is based on a sense of gratitude for heroic service, not on economic considerations. This is the answer to those who have criticized it as class legislation or the proposal to grant special privileges to one element of our citizenship or as a plunge into socialism. Frankly, we avow our purpose to do for the soldier what we would not think of doing for anybody else and what would not be justified solely as a matter of reclamation.

Many measures of soldier legislation have been introduced into Congress. Only one of these has been favorably reported. This was introduced by Representative Mondell, of Wyoming, on the first day of the present special session, embodying the plan of reclamation and community settlement brought forward by this department in the spring of 1918.

The measure has been much misunderstood and sometimes deliberately misrepresented. In the first place, it was not put forward as the complete solution of the soldier problem. It was at no time supposed or expected that all of the 4,800,000 men and women engaged in the war with Germany would or could take advantage of its provisions. It fortunately happens that the vast majority quickly found their places in the national life. Of the remainder, a very large proportion may be classified as "city minded." They have no taste for farm life but would be better served by vocational training and opportunities to enter upon remunerative trades or professions. There is an element of "country minded," and of these some 150,000 have made application for opportunities of employment and home-making under the terms of this bill. Largely they are men who have had agricultural experience but who can not obtain farms of their own without very considerable cash advances and other assistance which the Government could render. It is for this element that the policy is designed.

It has often been said that the plan would be applied only in the West and South. The truth is that it has been the purpose from the first to extend it to every State where feasible projects

could be found, and that our preliminary investigations lead us to believe this will include every State in the Union.

The wide discussion of the measure has been highly educational to the country, and some of the criticism is of constructive character. For example, attention has been sharply called to the fact that in certain localities there are individual farms well suited to our purpose which may often be had at a price representing rather less than the value of their improvements. These are the so-called "abandoned farms" so numerous in the Northeastern States. In some cases they are interspersed with land now cultivated, so situated that it is not possible to bring together a large number of contiguous farms as the basis of a Government project.

In New England and elsewhere public sentiment strongly favors a modification of the pending measure which will enable the purchase of individual farms rather than community settlement. This would be practicable only in localities where a sufficient number of farms, even if not contiguous, could be had to make possible the necessary supervision and instruction, together with cooperative organization for the purchase of supplies and sale of products. Without these advantages the plan of soldier settlement would fail in many instances. My information is that these conditions could be met. Not only so, but it is urged that existing farm communities would be inspired by the presence of soldier settlers and benefited by the presence of soldier settlers by their cooperative buying and selling agencies.

Another criticism of the pending measure is directed to the amount of the first payment the soldier settler is required to make. As the bill now stands it calls for 5 per cent on the land, 25 per cent on improvements and live stock, and 40 per cent on implements and other equipment. It has been urged by some friends of soldier settlement that no first payment should be required, but that the Government should make advances of 100 per cent in view of the soldiers' peculiar claim upon national consideration. It might be feasible to do this in the case of community settlements. But it could not be done in the case of scattered and individual farms, at least without abandoning the principles of sound business.

In the case of community settlement the soldier literally "gets in on the ground floor." Starting with a territory that is entirely blank so far as homes and improvements are concerned, he finds himself in a place where community values remain to be created. When he buys an improved farm in a settled neighborhood the situation is precisely reversed. In both cases there is or will be "unearned increment," or society-created values; but in the one case he *gets* the increment, while in the other case he *pays* it. Obviously, a larger advance would be justified in one case than in the other.

ALASKA.

One of the first recommendations made by me in my report of seven years ago was that the Government build a railroad from Seward to Fairbanks in Alaska. Five years ago you intrusted to me the direction of this work. The road is now more than two-thirds built, and Congress at this session, after exhaustively examining into the work, has authorized an additional appropriation sufficient for its completion. The showing made before Congress was that the road had been built without graft: every dollar has gone into actual work or material. It has been built without giving profits to any large contractors, for it has been constructed entirely by small contractors or by day's labor. It has been built without touch of politics: every man on the road has been chosen exclusively for ability and experience. It has been well and solidly built as a permanent road, not an exploiting road. It has been built for as little money as private parties could have built it, as all competent independent engineers who have seen the road advise.

Edwin F. Wendt, of the Interstate Commerce Commission, in charge of valuation of the railroads of the United States from Pittsburgh to Boston, after an investigation into the manner in which the Alaskan Railroad was constructed and its cost, reported to me as follows:

> In concluding, it is not amiss to again state that after the full study which was given to the property during our trip, we are satisfied that the project is being executed rapidly and efficiently by men of experience and ability. It is believed that it is being handled as cheaply as private contractors could handle it under the circumstances.

The road has not been built as soon as expected because each year we have exhausted our appropriation before the work contemplated had been done. We could not say in October of one year what the cost of anything a year or more later would be, and we ran out of money earlier than anticipated. It has not been built as cheaply as expected because it has been built on a rising market for everything that went into its construction—from labor, lumber, food supplies, machinery, and steel to rail and ocean transportation. I believe, however, it can safely be said that no other piece of Government construction or private construction done during the war will show a less percentage of increase over a cost that was estimated more than four years ago.

The men have been well housed and well fed. Their wages have been good and promptly paid; there has been but one strike, and that was four years ago and was settled by Department of Labor experts fixing the scale of wages. The men have had the benefit of a system of compensation for damages like that in the Reclamation Service and Panama Canal. They have had excellent hospital service, and our

camps and towns have been free of typhoid fever and malaria. That the men like the work is testified by the fact that hundreds who "came out" the past two years, attracted by the high wages of war industries, are now anxious to return to Alaska.

There has been but one setback in the construction, and that was the washing out of 12 miles of tracks along the Nenana River. This is a glacial stream which, when the snows melt, comes down at times with irresistible force. In this instance it abandoned its long accustomed way and cut into a new bed and through trees that had been standing for several generations, tearing out part of the track which had been laid.

The work of locating and constructing the road has been left in the hands of the engineers appointed by yourself. The only instruction which they received from me was that they should build the road as if they were working for a private concern, selecting the best men for the work irrespective of politics or pressure of any kind. As a result, we have a force that has been gathered from the construction camps of the western railroads, made up of men of experience and proved capacity. That they have done their work efficiently, honestly, and at reasonable cost is my belief.

It is not possible during the construction of a railroad to tell what it costs per mile because all the foundation work, the construction of bases from which to work, the equipment for construction, and much of the material is a charge which must be spread over the entire completed line. The best estimate that can be made to-day as to the newly constructed road is that it has cost between $70,000 and $80,000 per main-line mile, or between $60,000 and $70,000 per mile of track.

This cost per mile includes the building of the most difficult and expensive stretch of line along the entire route from Seward to Fairbanks—that running along Turnagain Arm, which is sheer rock rising precipitously from the sea for nearly 30 miles. There are miles of this road which have cost $200,000 per mile. Even to blast a mule trail in one portion of this route cost $25,000 a mile.

The only Government-built railroad—that across the Isthmus of Panama—cost $221,052 per mile. The only two recently built railroads in the United States are (1) the Virginian, built by H. H. Rogers, which cost exclusive of equipment $151,000 per mile, with labor at from $1.35 to $1.75 per day and all machinery, fuel, rails, and supplies at its door, and (2) the Milwaukee line to Puget Sound, which is estimated as having cost $130,000 per mile exclusive of equipment.

The work has been conducted with its main base at Anchorage, which is at the head of Cook Inlet. The point was chosen as the nearest point from which to construct a railroad into the Matanuska

coal fields. That was the primary objective of the railroad, to get at the Matanuska coal. From Anchorage it was also intended to drive farther north through the Susitna Valley and across Broad Pass, and to the south along Turnagain Arm toward the Alaska Northern track. To secure coal for Alaska was the first need. So in addition to Anchorage as a base, one was also started at Nenana, on the Tanana River, from which to reach the Nenana coal fields lying to the south. If these two fields were open, one would supply the coast of Alaska and one the interior. This program has been acted upon, with the result that the Matanuska field is open to tidewater with a downgrade road all the way. The Nenana road has been pushed far enough south to touch a coal mine near the track, which may obviate the immediate necessity for reaching into the Nenana field proper.

There is an open stretch across Broad Pass to connect the Susitna Valley with the road coming down from Nenana. This gap closed, there will be through connection between Seward and Fairbanks.

MATANUSKA COAL.

By decisions of the Commissioner of the Land Office all of the claims in the Matanuska coal field were set aside, and by act of Congress a leasing bill was put into effect over the entire field. Under this law a number of claims must be reserved to the Government. The field was surveyed, and some of the most promising portions of the field have been so reserved.

Two leases have been entered into by the Government, one with Lars Netland, a miner, who has a backer, Mr. Fontana, a business man of San Francisco, and the other with Oliver La Duke and associates. There are many thousands of acres in this field which are open for lease and which will be leased to any responsible parties who will undertake their development. Government experts who have examined this field do not promise without further exploring a larger output of coal from this field than 150,000 tons a year.

The population of Alaska has fallen off during the war. She sent, I am told, 5,000 men into the Army, the largest proportion to population sent by any part of the United States. The high cost of labor and materials closed some of the gold mines, and the attractive wages offered by war industries drew labor from Alaska to the mainland. All prospecting practically closed. But with the return of peace there is evidence of a new movement toward that Territory which should be given added confidence in its future by the completion of the Alaskan Railroad. There is enough arable land in Alaska to maintain a population the equal of all those now living in Norway, Sweden, and Finland, and all that can be produced in those countries can be produced in Alaska. The great need is a market, and this will be found only as the mining and fishing industries of the country develop.

SAVE AND DEVELOP AMERICANS.

When the whole story is told of American achievement and the picture is painted of our material resources, we come back to the plain but all-significant fact that far beyond all our possessions in land and coal and waters and oil and industries is the American man. To him, to his spirit and to his character, to his skill and to his intelligence is due all the credit for the land in which we live. And that resource we are neglecting. He may be the best nurtured and the best clothed and the best housed of all men on this great globe. He may have more chances to become independent and even rich. He may have opportunities for schooling nowhere else afforded. He may have a freedom to speak and to worship and to exercise his judgment over the affairs of the Nation. And yet he is the most neglected of our resources because he does not know how rich he is, how rich beyond all other men he is. Not rich in money—I do not speak of that—but rich in the endowment of powers and possibilities no other man ever was given.

Twenty-five per cent of the 1,600,000 men between 21 and 31 years of age who were first drafted into our Army could not read nor write our language, and tens of thousands could not speak it nor understand it. To them the daily paper telling what Von Hindenberg was doing was a blur. To them the appeals of Hoover came by word of mouth, if at all. To them the messages of their commander in chief were as so much blank paper. To them the word of mother or sweetheart came filtering in through other eyes that had to read their letters.

Now this is wrong. There is something lacking in the sense of a society that would permit it in a land of public schools that assumes leadership in the world.

Here is raw material truly, of the most important kind and the greatest possibility for good as well as for ill.

Save! Save! Save! This has been the mandate for the past two years. It is a word with which this report is replete. But we have been talking of food and land and oil while the boys and young men that are about us who carry the fortune of the democracy in their hands are without a primary knowledge of our institutions, our history, our wars and what we have fought for, our men and what they have stood for, our country and what its place in the world is.

The marvelous force of public opinion and the rare absorbing quality of the American mind never was shown more clearly than by the fact that out of these men came a loyalty and a stern devotion to America when the day of test came. Had Germany known what we know now, it would have been beyond her to believe that America could draft an army to adventure into war in Europe. There should not be a man who was in our Army or our Navy who has the ambi-

tion for an education who should not be given that opportunity—indeed, induced to take it—not merely out of appreciation but out of the greater value to the Nation that he would be if the tools of life were put into his hand. There is no word to say upon this theme of Americanization that has not been said, and Congress, it is now hoped, will believe those figures which, when presented nearly two years ago, were flouted as untrue. The Nation is humiliated at its own indifference, and action must be the result.

To save and to develop, I have said, were equally the expression of a true conservation. What is true as to material things is true as to human beings. And once given a foundation of health there is no other course by which this policy may be effected than to place at the command of every one the means of acquiring knowledge. The whole people must turn in that direction. We should enable all, without distinction, to have that training for which they are fitted by their own natural endowment. Then we can draw out of hiding the talents that have been hidden. The school will yet come to be the first institution of our land, in acknowledged preeminence in the making of Americans who understand why they are Americans and why to be one is worth while.[1]

Respectfully, yours,

FRANKLIN K. LANE,
Secretary.

The PRESIDENT.

[1] Assistant Secretary Herbert Kaufman before the Senate Committee on Education presented facts and figures which accentuate the seriousness of the national situation. Among other things he said:

"The South leads in illiteracy, but the North leads in non-English speaking. Over 17 per cent of the persons in the east-south Central States have never been to school. Approximately 16 per cent of the people of Passaic, N. J., must deal with their fellow workers and employers through interpreters. And 13 per cent of the folk in Lawrence and Fall River, Mass., are utter strangers in a strange land.

"The extent to which our industries are dependent upon this labor is perilous to all standards of efficiency. Their ignorance not only retards production and confuses administration, but constantly piles up a junk heap of broken humans and damaged machines which cost the Nation incalculably.

"It is our duty to interpret America to all potential Americans in terms of protection as well as of opportunity; and neither the opportunities of this continent nor that humanity which is the genius of American democracy can be rendered intelligible to these 8,000,000 until they can talk and read and write our language.

"Steel and iron manufacturers employ 58 per cent of foreign-born helpers; the slaughtering and meat-packing trades, 61 per cent; bituminous coal mining, 62 per cent; the silk and dye trade, 34 per cent; glass-making enterprises, 38 per cent; woolen mills, 62 per cent; cotton factories, 69 per cent; the clothing business, 72 per cent; boot and shoe manufacturers, 27 per cent; leather tanners, 57 per cent; furniture factories, 59 per cent; glove manufacturers, 33 per cent; cigar and tobacco trades, 33 per cent; oil refiners, 67 per cent; and sugar refiners, 85 per cent.

"You will agree with me that future security compels attention to such concentrations of unread, unsocialized masses thus conveniently and perilously grouped for misguidance.

"They live in America, but America does not live in them. How can all be 'free and equal' until they have free access to the same sources of self-help and an equal chance to secure them?

"Illiteracy is a pick-and-shovel estate, a life sentence to meniality. Democracy may not have fixed classes and survive. The first duty of Congress is to preserve opportunity

for the whole people, and opportunity can not exist where there is no means of information.

"It is a shabby economy, an ungrateful economy that withholds funds for their betterment. The fields of France cry shame upon those who are content to abandon them to their handicap.

"The loyal service of immigrant soldiers and sailors commit us to instruct and nationalize their brothers in breed.

"The spirit in which these United States were conceived insists that the Republic remove the cruel disadvantage under which so many native borns despairingly carry on.

"How may they reason soundly or plan sagely? The man who knows nothing of the past can find little in the future. The less he has gleaned from human experience the more he may be expected to duplicate its signal errors. No argument is too ridiculous for acceptance: no sophistry can seem far-fetched to a person without the sense to confound it.

"Anarchy shall never want for mobs while the uninformed are left at the mercy of false prophets. Those who have no way to estimate the worth of America are unlikely to value its institutions fairly. Blind to facts, the wildest one-eyed argument can sway them.

"Not until we can teach our illiterate millions the truths about the land to which they have come and in which they were born shall its spirit reach them—not until they can read can we set them right and empower them to inherit their estate.

"If we continue to neglect them, there are influences at work that will sooner or later convince them who now fail to appreciate the worth of our Government that the Government itself has failed—crowd the melting pot with class hates and violence and befoul its yield.

"We must not be tried by inquest. We demand the right to vindicate the merit of our systems wherever their integrity is questioned or maligned.

"We demand the right to regulate the cheating scales upon which the Republic is weighed by its ill-wishers.

"We demand the right to protect unintelligence from Esau bargains with hucksters of traitorous creeds.

"We demand the right to present our case and our cause to the unlettered mass, whose benightedness and ready prejudices continually invite exploitation.

"We demand the right to vaccinate credulous inexperience against Bolshevism and kindred plagues.

"We demand the right to render all whose kind we deem fit to fight for our flag fit to vote and prosper under its folds.

"We demand the right to bring the American language to every American, to qualify each inhabitant of these United States for self-determination, self-uplift, and self-defense."

Dr. Philander P. Claxton, Commissioner of Education, in his analysis of the illiteracy figures of the census, said:

"Illiteracy is not confined to any one race or class or section. Of the 5,500,000 illiterates as reported by the census of 1910, nearly 3,225,000 were whites, and more than 1,500,000 were native-born whites.

"That illiteracy is not a problem of any one section alone is shown by the fact that in 1910 Massachusetts had 7,469 more illiterate men of voting age than Arkansas; Michigan, 2,663 more than West Virginia; Maryland, 2,352 more than Florida; Ohio, more than twice as many as New Mexico and Arizona combined; Pennsylvania, 5,689 more than Tennessee and Kentucky combined. Boston had more illiterates than Baltimore, Pittsburgh more than New Orleans, Fall River more than Birmingham, Providence nearly twice as many as Nashville, and the city of Washington 5,000 more than the city of Memphis.

"It is especially significant that of the 1,534,272 native-born white illiterates reported in the 1910 census 1,312,372, about 87.5 per cent, were in the open country and small towns, and only 191,900, or 12.5 per cent, were in cities having a population of 2,500 and over. Of the 2,227,731 illiterate negroes 1,834,458, or 82.3 per cent, were in the country, and only 393,273, or 17.7 per cent, were in the cities."

ADMINISTRATIVE EFFORT.

THE GENERAL LAND OFFICE.

1. Allowed during the fiscal year original entries of Indian and public lands 11,871,181.50 acres, an increase of 1,896,849.89 acres over the area entered and allowed during the fiscal year 1918.

2. Patented during the fiscal year an area of 10,777,001.349 acres, an increase over the fiscal year of 1918 of 1,224,519.132 acres.

3. Collected from all sources during the year $4,303,674.20, and expended during the same time in the public land service, $3,026,554.46, leaving a net surplus of receipts over expenditures of $1,277,119.74.

4. Collected and turned into the United States Treasury as the result of the work of the field service, $101,298.96.

5. Restored to the public domain as the result of investigation in the field, 164,363.83 acres.

6. Secured as escrow deposits, under contracts entered into with oil-land claimants under the act of August 25, 1914 (38 Stat., 708), up to the end of the fiscal year, $4,325,005.84.

7. Secured as escrow deposits by operators under oil-land leases from the State of Wyoming, $2,119,306.58.

8. Obtained judicial decree quieting title in the United States to 617 acres of oil-producing lands in the State of Louisiana, with an award of $462,903.39 for oil taken in trespass.

9. Obtained a judicial decree quieting title in the United States to 54,000 acres of Arkansas "Sunk lands," of the value of $2,700,000.

10. Approved and accepted surveys and resurveys covering an area of 7,668,514 acres.

11. Approved for patent 40,131 homestead and kindred entries, as against 32,120 the year previous.

12. Allowed 15,037 stock-raising homestead entries covering an area of 5,559,235 acres.

13. Secured the withdrawal for stock driveway purposes, under the grazing homestead act, 4,303,727 acres. The total area thus withdrawn at present is 6,623,531 acres.

14. Promulgated administrative ruling of June 13, 1919, discontinuing the application of the rule of approximation in the location of soldiers' additional homestead rights.

15. Received from the sale of town lots outside of Alaska, $112,871.30.

16. Received from the sale of town lots in Alaska, $31,474.91.

17. Patented under the Carey Act, 85,699 acres.

18. Patented 1,675 desert-land entries, embracing 267,065 acres.

19. Patented 653 final reclamation homestead entries.

20. Certified under State grants as school indemnity, and for other purposes, 1,628,834 acres.

21. Eliminated from national forests 21,267 acres of school-section lands by exchange for other lands through cooperative agreements with the grantee States.

22. Secured an agreement with the State of Washington for the institution of legal proceedings by which a decision may be obtained as to the applicability of the provisions of the act of February 28, 1891 (26 Stat., 796), to the school grant of the State; action on 85,000 acres of selections remaining suspended in the meantime.

23. Patented under railroad grants 632,284 acres.

24. Completed the classification of the revested lands embraced in the former grant to the Oregon & California Railroad Co. so far as susceptible of such action at the present time.

25. Surveyed 182,000 acres of land embraced in the Oregon and California grant as a prerequisite to the adjustment thereof under the act of revestment.

26. Sold the timber on 2,875 acres of revested Oregon and California grant lands for the sum of $96,497.83.

27. Received proposals for the exchange under the act of May 31, 1918, of approximately 80,000 acres of revested Oregon and California lands.

28. Issued 3,207 patents in fee to Indians for a total acreage of 410,529 acres.

29. Approved for patent under the Minnesota drainage act 1,118 entries, covering an area of 176,320 acres as against 146,240 acres the year previous. A total area of 766,920 acres has been patented under this act.

30. Approved for patent mineral entries covering 32,559.77 acres, for which $137,381.09 was received, and coal entries for 7,843.17 acres, for which $295,031.75 was received.

31. Secured a coal-land lease in the Bering River field for 2,080 acres, making a total of 4,500 acres under lease in that field, with 2,840 acres under lease in the Matanuska field.

32. Decided 10,017 litigated cases aside from mineral contests.

33. Investigated in the field and reported on 17,399 cases.

34. Obtained 14 convictions in criminal cases prosecuted during the year.

35. Received during the year 200 applications for permits to prospect for potash.

THE INDIAN OFFICE.

1. Under the "Declaration of Policy," of April, 1917, issued 10,956 fee patents, or 1,062 more than in the 10 years preceding, 4,376 of which were within the last year; broadened the policy to include those of one-half Indian blood. Instituted special measures for the rapid settlement of about 20,000 inherited estates.

2. Cites information showing that Indian soldiers gained great benefit from war service in white organizations and won distinction for individual valor.

3. Maintained efficiency in Indian schools under depletion of service caused by the war. Emphasized the policy of enrolling Indian children in public schools and requiring well-to-do parents and citizen Indians to pay the expense of their children's education, and amended school regulations with a view to reserving Government schools for Indians not well provided with such facilities.

4. Kept all health conditions among the Indians as nearly normal as was possible in view of extreme shortage of physicians and nurses requisitioned by the war, and combated in the main successfully the epidemic of Spanish influenza. Formulated plans for aggressive health work during the coming year, and will emphasize the prevention of disease through better housing, better water supplies, better bodily nutrition, and the practice of hygiene, sanitation, and well-ordered living.

5. Instituted during the year 1,516 new cases against illicit liquor traffic and disposed of 2,135. Seized and destroyed 33,924 gallons of intoxicants; libeled and sold 112 automobiles engaged in illegal traffic; and conducted prosecutions for violations of State, Federal, and municipal laws in 27 different States.

6. Continued farming, gardening, and stock raising among the Indians on a war-time basis of production, and secured greater use of agricultural machinery and improved methods of tillage. Stimulated high-grade cotton culture, improvement of stock breeds, and completed the eradication of contagious diseases among stock on several reservations in the Northwest.

7. Overcame high cost of all material, and the scarcity of labor in irrigation construction by greater use of mechanical appliances, such as dredges, excavators, and ditch cleaners. Extended irrigated areas in the Northwest, where the Yakima project, Washington, returned last year a value of $9,000,000 in crops; installed additional wells to supply drinking water for live stock on the arid Indian lands of Arizona and New Mexico, and increased the sewerage and domestic water supply of some of the Indian pueblos.

8. Made 1,213 allotments to Indians of irrigable and nonirrigable land on the reservations, about 1,000 reallotments, under provision of law, and 315 allotments comprising 46,207 acres on the public domain. Sold 115,367 acres of Indian land for the highest average price ever received, $25.65 per acre. Continued the leasing of surplus Indian lands with excellent results in the increase of general farm products.

9. Disbursed to individual Indians of the Five Civilized Tribes from land sales, equalization, royalties and per capita payments $7,812,331.44, and supplied them houses, barns, improvements, and miscellaneous articles in the value of $1,110,618.53. Sent a competency commission to the Creek Tribe to determine such as are capable of controlling their allotted land, and removed restrictions from 57,000 acres. To June 30, 1919, tribal land of the Five Civilized Tribes had been sold for $20,376,096.27 and their unsold tribal property was worth approximately $18,000.000. These nations made substantial gains in agriculture and stock raising during the year.

10. Sold 1,700,000,000 feet of timber from reservation forests; cut 30,000,000 feet under contract on the Red Lake Reservation, and extended the construction of roads and bridges on the reservations, largely through Indian labor.

11. The office probate work included appearance by attorneys in more than 7,000 regular cases, the final disposition of about 2,700 cases besides action on a large number of wills and some 3,000 miscellaneous matters.

12. Osage oil and gas leases were consummated for a consideration of $11,473,820, in addition to royalties. The year's gross production of oil for this tribe numbered 12,138,086 barrels, and their revenue from oil and gas was approximately $17,000,000. The restricted land of the Five Civilized Tribes yielded in the year 10,180,862 barrels of oil and $4,073,985 from oil and gas. Other reservations in Oklahoma and farther west added extensive mineral returns to the foregoing.

13. Forty per cent of reimbursable funds loaned to Indians has been repaid and the remaining installments are well secured. Tribal herds purchased from such funds have been profitable.

14. The disbursement of individual funds to adult and minor Indians is proceeding with a liberal view to the emancipation of the Indian from Government control.

15. Active work is in progress in behalf of the Seminoles of Florida, the Alabama Indians in Texas, and the homeless bands of California.

16. The bureau is assisting the Department of Justice in important litigation now before the Supreme Court of the District of Columbia involving the title to practically all of the land within the present Papago Reservation.

THE BUREAU OF PENSIONS.

1. Paid for pensions, $222,159,292.

2. Returned to the Treasury $947,170.97 of the amount appropriated for the payment of pensions.

3. Returned to the Treasury $118,419.86 of the sum appropriated for the maintenance and expense of the pension system, including salaries of special examiners.

4. Reduced the number of employees by 58.

5. Under the act of July 16, 1918, providing pensions to widows and minor children of officers and enlisted men who served in the War with Spain, Philippine insurrection, or in China, pensions have been granted to 992 widows, 72 minor children, and 1 helpless child. There are a number of claims still pending under this act.

6. Receipts for addresses, certified copies, etc. (act Aug. 24, 1912), $2,153.70. Refundments to pension apropriations, $6,890.05. Miscellaneous receipts, $3,041.15.

THE PATENT OFFICE.

Granted—Patents on mechanical inventions	37,259
Granted—Reissue patents	205
Granted—Design patents	1,355
Registered—Trade-marks	3,766
Registered—Labels	572
Registered—Prints	196
Total	43,353
Sold—Copies of patents	2,163,057
Shipped to foreign countries—Copies of patents	991,976
Copies of printed office records certified to	6,616
Recorded—Assignments	29,973
Number of words furnished by making photostat copies of office records	9,196,900
Number of typewritten words furnished as copies of office records	18,253,700
Number of applications filed for—	
Inventions	62,755
Designs	2,787
Reissues	226
Trade-marks	8,561
Labels	934
Prints	394
Total	75,657
Number of applications allowed	51,707
Number of amendments filed	143,778
Number of appeals on merits	1,914
Number of petitions to commissioner	3,575
Number of notices of opposition	144
Number of interferences declared	1,264

Number of interferences disposed of	1,210
Number of letters constituting miscellaneous correspondence received, answered, and indexed	250,262
Number of photostat copies of foreign patents furnished	107,496
Number of photographic copies furnished	56,307
Number of photostat copies furnished other departments without charge	5,062
Number of photostat copies made for use in the Patent Office	22,389

THE BUREAU OF EDUCATION.

1. Promoted the education of foreign-born residents through classes in schools and industrial plants, urged State legislative action for the education of immigrants, conducted conferences on Americanization, prepared articles on Americanization for papers having a circulation of 5,000,000 and assisted in organizing societies for the promotion of Americanization work.

2. Promoted the establishment of courses in community organization in colleges and universities, developed regular communication with 1,000 community organizations, and in cooperation with the Post Office Department arranged an experiment for cooperative buying and selling at schoolhouses as community centers.

3. Enrolled over 2,000,000 school children in 2,529 cities of the United States in school-directed home gardening. The total value of the product of the gardens approximated $18,000,000.

4. Assisted the Committee on Education and Special Training in the formation of plans for training mechanics and technicians for the Army in civilian institutions and in establishing a Students' Army Training Corps.

5. Made a survey of 15 major cities and 250 smaller cities to ascertain their needs for commercial education with special reference to foreign-trade training.

6. In the School Board Service Division registered 20,000 high-grade teachers and made 15,000 nominations for positions.

7. Cooperated with the overseas educational commission of the Y. M. C. A. in preparing a course in citizenship for soldiers overseas.

8. Provided for State and local information on negro education, cooperated with the Y. M. C. A. in work among negro soldiers in France and advised with the Committee on Education and Special Training on the training of negro soldiers.

9. With the cooperation of the Child Health Organization published and distributed a series of health education bulletins and secured their widespread use in many cities and States.

10. In educational extension work distributed Federal documents, war courses, and package libraries.

11. Collected 6,000,000 feet of motion-picture film and deposited 4,000,000 feet of it with the extension divisions of universities.

12. With the cooperation of the governor of Alaska helped to check the spread of influenza and to relieve the suffering among the natives.

13. Made and completed, at the request of State and local school authorities, six educational surveys.

14. Secured data for a thorough and complete report of rural school consolidation in the country at large and in certain typical counties.

15. Held four important national and sectional conferences on rural education.

16. Held four conferences on plans for the improvement of schools in villages and small towns.

17. Undertook to work out with the cooperation with the Erlanger Mill Corporation a model system of schools for a cotton-mill village.

18. Held a conference of superintendents of city schools for the purpose of working out an adaptation of the school program to fit the industrial needs of older pupils during the war.

19. Held five conferences in Washington and three in other cities of the United States on various phases of industrial education and home making.

20. Conducted an intensive campaign for the establishment of kindergartens in Texas.

21. Distributed a leaflet on the use of the kindergarten in furthering the work of Americanization.

22. Collected statistics for the biennial survey of education throughout the United States for the biennial period 1916–1918.

23. Initiated and partly secured the adoption of a plan for securing from State departments of education educational statistics, collected by uniform methods throughout the United States.

24. Printed and circulated 1,505,448 copies of bulletins, reports, and other documents and 1,396,518 copies of circulars and duplicated letters.

25. Prepared and issued 93 educational bulletins and published the magazines "School Life," "Americanization," "National School Service," and "National Library Service."

26. Conducted an extensive correspondence on educational matters. In all 227,958 letters were received, an increase of 65,479 over 1918.

27. Prepared 100 new educational bibliographies and issued a series of six library leaflets.

28. Prepared and distributed information upon college opportunities for returning soldiers.

29. Prepared and distributed to State legislatures a manual of educational legislation.

30. Made a comprehensive study of free public libraries as they affect the rural population of the country.

31. Prepared and distributed a series of after-war reading courses for returned soldiers and for those in cantonments.

THE GEOLOGICAL SURVEY.

1. Continued its war work on the country's metallic mineral resources, making a census and special studies of deposits of iron, manganese, tungsten, zirconium, molybdenum, and quicksilver, extending further its search for new deposits, and preparing a wall map showing the deposits of manganese ore in the United States.

2. Contributed reports on mercury, graphite, phosphate rock, manganese, antimony, tungsten, magnesite, emery, corundum, bauxite and aluminum, and platinum to a series of mimeographed pamphlets issued by the Interior Department, showing the commercial control of these commodities throughout the world.

3. Collected weekly statistics of the production of copper, lead, zinc, and aluminum, and furnished them to the Government purchasing agencies, and cooperated with the War Industries Board and the Shipping Board in preparing tables and diagrams showing the supplies of minerals available and the estimated requirements.

4. Cooperated with the Fuel Administration in collecting statistics of production and movement of coal and coke, and mapped and filed data for the use of the Fuel Administration and other branches of the Government.

5. Carried along still further its studies to discover how far water power might be used to replace coal in view of the stress and the difficulties in mining and marketing coal, and cooperated with the Fuel Administration in working out a comprehensive scheme of classification of coals and a zoning system applicable to the country's coal fields and coal industry, to insure economy and efficiency in mining and transportation.

6. Continued its work in oil and gas fields and its search, both at home and abroad, for potash and nitrates, minerals urgently needed in the prosecution of the war.

7. Made examinations and estimates of resources of natural gas and a special cooperative research for helium-rich gas for use in inflating war balloons.

8. Made further studies of porous rocks, to discover more buoyant material for making concrete ships, and made search for material adapted to use as smudges.

9. Made examinations of deposits of high-grade clays in the eastern part of the United States to determine their availability for making paper or for making articles of porcelain or articles for use in electrical equipment.

10. Compiled information on road-building material for use in connection with a military map of the country.

11. Made about 1,500 laboratory analyses and assays, among them tests of rocks for platinum, a metal much needed for military use, and special determinations of the potash content of certain rocks.

12. Prepared military maps and descriptions of the country around several camps and training stations.

13. Prepared for the use of the Shipping Board 82 topographic maps and 69 accompanying tracings showing military information, and a large wall map of the world.

14. Prepared for the War Department and for boards and bureaus engaged in the conduct of the war information concerning water supplies from springs and wells in different parts of the country, as well as maps and descriptions of water supplies along the international border and the Atlantic coast.

15. Gave information and advice to the War and Navy Departments in regard to water supply at about 100 military and naval establishments in the United States, such as cantonments, forts, navy yards, aviation fields, powder factories, arsenals, and supply depots.

16. Made examinations of underground water for many camps, cantonments, and military and naval stations.

17. Prepared maps and data showing the location and extent of mineral deposits in foreign countries, their quality and their output by districts and regions, and the distribution of minerals in the world's commerce.

18. Prepared chapters on mineral commodities and on economic conditions in Japan and Sweden for incorporation in a report compiled by the Bureau of Research of the War Trade Board.

19. Prepared for the Capital Issues Committee geologic and statistical information to aid in directing capital into the fields where it would be of greatest use during the war.

20. Prepared, in cooperation with the Central Bureau of Planning and Statistics, a voluminous index of the information in the possession of several Government organizations concerning mineral resources.

21. Made a geologic reconnoissance of the islands of St. Thomas, St. John, and St. Croix of the Virgin Islands at the request of the Acting Secretary of the Navy and of the governor and naval commandant of the islands, with particular studies of the ground-water resources.

22. Investigated ground-water resources of eastern Porto Rico in compliance with a request from the Navy Department and examined manganese deposits of the island.

23. Continued surveys in Alaska, examining especially deposits of chromite and tin, making investigations in the region now being developed by the Government railroad, and continuing measurements of stream flow.

24. Made topographic surveys of areas in Alaska aggregating about 1,200 miles and geologic surveys of areas aggregating 3,500 square miles.

25. Maintained during the entire year a branch office in Alaska to provide closer cooperation between the Geological Survey and the operators of the Government coal mines, to keep in touch with local developments, and to furnish aid to prospectors and miners by giving them publications and information.

26. Collected annual statistics of the mineral production of Alaska.

27. Mapped more than 10,000 square miles of territory in the United States, laid more than 4,000 linear miles of primary traverse and more than 4,000 linear miles of levels, and established more than 2,000 permanent bench marks, occupying 61 triangulation stations and permanently marking 50 stations.

28. Instructed about 100 enlisted men in topographic map drafting.

29. Continued investigations of stream flow by maintaining more than 1,200 gauging stations in 38 States and in Hawaii and Alaska.

30. Continued statistical studies of power resources and output and investigated, in cooperation with the United States Fuel Administration, problems relating to the operation of power plants, the interconnection of transmission systems, and the substitution of water power for fuel power.

31. Prepared reports on desert watering places under a plan for mapping and marking the watering places in the arid region east of the Sierra Nevada and the Cascade Range and west of a line running from eastern Oregon through Salt Lake City and Santa Fe to the mouth of Pecos River.

32. Classified 6,439 acres of public lands as to their content of coal, 3,703 acres as coal land, and 2,736 acres as noncoal land.

33. Recommended withdrawal of 2,415 acres of coal land and restoration to entry of 3,331,552 acres, the classification and appraisal of which had been completed.

34. Recommended withdrawal from entry of 239,946 acres of probable oil land and the restoration to entry of 931 acres to entry as non-oil land.

35. Classified 129,421 acres of lands as to their content of oil shale, of which 125,341 acres were classified as lands valuable as a source of petroleum and nitrogen and 4,080 acres were classified as non-mineral lands.

36. Recommended withdrawals and restorations of oil-shale lands resulting in a reduction of the total oil-shale reserves to 128,267 acres, practically all of it reserved for the use of the Navy.

37. Reduced the reserves of potash-bearing land by 440 acres, leaving 130,029 acres now reserved.

38. Cooperated with the General Land Office and the Indian Office in supplying information concerning the mineral or nonmineral value and the value as to water resources of lands for which applications have been filed, acting on 4,259 such requests.

39. Furnished the General Land Office reports on the feasibility of irrigation projects and proposed power developments representing 240 cases.

40. Recommended the designation of 8,452,637 acres of land as nonirrigable under the enlarged-homestead act and the cancellation of the designation of 5,254 acres that had been previously classed as nonirrigable on information that the lands are irrigable.

41. Recommended the withdrawal of 7,392 acres for power sites and the restoration of 6,037 acres, leaving the total now so reserved 2,565,727 acres.

42. Investigated both surface and ground waters in connection with the classification of public lands with special reference to their use for power under permit or for agriculture under the enlarged-homestead, desert-land, or Carey acts.

43. Disposed of 29,176 applications made for entry to land under the stock-raising homestead law.

44. Recommended addition to the public water reserves of 22,422 acres and the elimination from water reserves of 1,375 acres.

45. Continued work in its lithographic plant for bureaus, boards, and offices of the War Department, the Navy Department, and other branches of the Government, printing maps, charts, diagrams, and other work in editions aggregating several hundred thousand.

46. Engraved and printed 140 regular topographic maps of areas in the United States, and printed editions of 360 maps, amounting to 945,000 copies.

47. Performed contract and miscellaneous work involving the printing of 2,935,543 copies, the total copies of all work printed amounting to 3,884,849.

48. Photolithographed and printed 30 new topographic war maps and compiled and printed 9 special maps of Army camps and canton ments, on the backs of which special descriptive texts were printed.

49. Published 147 reports containing 11,644 pages.

50. Supplied through Members of Congress from their legal quota 2,163 schools with sets of maps showing the various types of country in the United States for use in teaching geography and physiography.

51. Distributed 465,826 books, 8,865 folios, and 538,396 maps.

THE RECLAMATION SERVICE.

1. Continued the construction and operation of irrigation works capable of furnishing water to 1,692,000 acres of arid land and actually irrigated in 1918 nearly 1,120,000 acres, covered by project statistics, producing crops valued at over $66,000,000.

2. Increased the area irrigated and covered by crop census 93,000 acres over that of the previous year.

3. Operated irrigation works including 40 reservoirs, several power and pumping plants, over 12,000 miles of canals and drains, as well as pipe lines, flumes, and tunnels and thousands of structures, such as dams, headgates, weirs, checks, drops, etc.

4. Continued the extension of the projects, including the construction of 296 miles of canals, 179 miles of drains, and nearly 8,000 canal structures, and excavated 14,000,000 cubic yards of earth and rock.

5. Continued the standardization of the numerous irrigation structures in the interest of economy and the efficient operation of the projects.

6. Continued the policy of stimulating crop production by expending construction funds where they would most quickly increase the productive area of the projects, by active cooperation with the farmers in leveling and otherwise preparing their lands for cultivation, by temporary leasing of withdrawn lands not yet ready for irrigation for dry farming and grazing purposes, by disposal of stored water to lands outside of the projects whenever it would result in increased production and would not jeopardize the project supply, and by encouraging better storage and marketing facilities.

7. Cooperated with other departments of the Government, with other bureaus of the Interior Department, with State governments, and with numerous local project organizations in the furtherance of reclamation work and the interests of the water users.

8. Carried on a survey of soldier-settlement possibilities throughout the United States resulting in the location of probably feasible projects in practically every State, ranging in area from 5,000 acres to over 200,000 acres.

THE BUREAU OF MINES.

Cooperated with various departments and bureaus of the Government in work relating to the war.

1. In cooperation with the War and Navy Departments continued work on a plant for recovering helium, a rare, noninflammable gas for balloons and airships from natural gas, and demonstrated the merits of the process used.

2. Completed the construction, in cooperation with the War Department, of a plant for manufacturing sodium cyanide by the Bucher process.

3. Investigated mining and milling problems at mineral deposits throughout the country in order to ascertain the available supply of war minerals, and how these minerals could be produced more efficiently.

4. Issued reports showing the markets for various ores, minerals, and metals, and giving data on the status of various mineral industries.

5. Made a thorough study of the manufacture of sulphuric acid in the United States.

6. As a result of an examination of methods of purifying crude graphite, developed improvements in milling practice.

7. Determined the possibility of substituting domestic for imported graphite in the manufacture of crucibles.

8. Made further advances in methods of utilizing radioactive substances.

9. During the year trained 9,781 miners in first aid and rescue methods at the mine safety cars and stations as compared with 8,851 in the fiscal year 1918.

10. Investigated causes of 29 mine accidents, 19 at coal mines and 10 at metal mines.

11. Determined the limitations of Army gas masks for use at mine and other fires and in industrial plants.

12. Sampled coal mines for the Navy Department and prepared reports on the quality of coal and the methods of mining and preparing it for market.

13. Continued work on the explosibility of coal dust from different mines, thereby gaining additional information on how coal-mine explosions can be prevented or limited.

14. Continued work on a method of signaling danger to miners underground by the injection of an ill-smelling substance into the compressed-air lines supplying machines and pumps.

15. Continued tests of explosives to determine their suitability for use in mines and quarries. Two new explosives were approved as permissible for use in dusty or gaseous coal mines. At the end of the year there were 162 explosives on the permissible list.

16. Made further tests of an explosive made of liquid oxygen mixed with carbonaceous material, and studied its suitability for mining work.

17. Determined the value of the geophone, a device for detecting sounds transmitted through earth, coal, and rock, with reference to its use in locating mine fires and in communicating with miners entombed by a disaster.

18. Completed a comprehensive review of explosion tests of coal dust at the experimental mine near Bruceton, Pa.

19. Completed, in cooperation with the Bureau of Indian Affairs, the appraisal of the segregated coal and asphalt lands in eastern Oklahoma which belong to the Choctaw and Chickasaw Nations.

20. Investigated, in cooperation with the Public Health Service, dust and ventilation conditions in mines in Arizona.

21. In cooperation with State mine inspectors collected and published monthly reports on fatalities at coal mines throughout the country.

22. Improved furnaces in boilers for the Emergency Fleet Corporation, increasing the economy 16 per cent.

23. Acted in an advisory capacity for the United States Fuel Administration in matters of conservation.

24. Planned, and had charge of the construction and operation of the Government fuel yard in the District of Columbia, whence all Federal buildings in the District are supplied.

25. Prepared for the War Department special steels containing uranium, tungsten, molybdenum, and zirconium.

26. In administering the act regulating the manufacture, sale, possession, and use of explosives during the war, supervised the work of about 14,000 licensing agents throughout the United States and its insular possessions; investigated accidents at explosives plants; examined magazines for storing explosives; and began numerous prosecutions against violators of the provisions of the act.

27. Cooperated with the War Industries Board in measures to reserve an adequate supply of platinum for war requirements.

28. Began a comprehensive investigation of the white clays of the United States and the value of these clays in the ceramic industry.

29. Cooperated with the Geological Survey of Ohio in making a survey of the fire clays of that State.

30. In cooperation with the State of Idaho, investigated the treatment of complex lead-zinc and copper-iron sulphide ores by flotation.

31. Investigated the fuel value of the lignite in the Nenana field, Alaska.

32. Through field demonstrations showed operators and well drillers how large wastes of oil underground may be prevented by cementing oil wells so as to prevent water from entering the oil sands.

33. Gave the Bureau of Internal Revenue a method for estimating the future and ultimate production of oil fields, and thus determining depletion allowances in taxation of oil properties.

34. Cooperated with the officials of the State of Wyoming in formulating a proposed law governing the drilling of wells in that State.

35. Cooperated with State officials of Illinois in remedying troubles from underground water in oil fields.

36. Made a nation-wide investigation of the grades of motor gasoline being marketed.

37. Demonstrated the value of absorption for recovering gasoline vapors in the residual gas from compression plants for obtaining gasoline from natural gas.

38. Gave further attention to the recovery of oil from the oil shales of Utah and other States.

39. Continued investigations of the fusing temperature of the ash of different coals, in order to show the liability of the coals to clinker.

40. Began a comprehensive investigation of the best methods of utilizing lignite.

ALASKAN ENGINEERING COMMISSION.

During the fiscal year ending June 30, 1919, the following work on the Alaska Railroad was accomplished:

Considerable rehabilitation work on the old Alaska Northern Railway, from Seward (mile 0) to mile 70.

Thirty-eight miles of grading between mile 227 and mile 265 was practically completed; also the greater part of the grading for the 36 miles between mile 417 and mile 453 was completed.

Seventeen miles of rail were laid between mile 74 and mile 91; also 26 miles between mile 365 and mile 391; also 3 miles between mile 414 and mile 417; also 6 miles between mile 453 and mile 459—a total of 52 miles.

Location surveys were continued between mile 265 and mile 365 over the Broad Pass region.

The bridge over the Talkeetna River at mile 227 was completed.

Approach to dock in Anchorage Harbor was practically completed.

Necessary maintenance of sections of the line in operation was attended to.

Fifty-five thousand three hundred and ninety tons of coal were mined at the two Government mines in the Matanuska field.

During the year work was seriously hampered through lack of funds caused by the delay in the passage of the deficiency and sundry civil bills until July. Such a handicap is not expected to recur, as the bill authorizing the appropriation of $17,000,000 (in addition to the $35,000,000 originally appropriated) for the completion of the Government railroad was passed by Congress in October. Six million dollars of this amount has been appropriated for the fiscal year ending June 30, 1920, and it is expected that the balance of $11,000,000 will be appropriated as needed.

Since June 30, 1919, and prior to the time that this report went to press, grading has been completed and track laid from mile 417 to mile 453, thus connecting Nenana and Fairbanks; also about 10 miles of rail has been laid north from Talkeetna at mile 227; also such progress in the construction of the dock at Anchorage has been made that the largest steamers now dock there.

The work which remains to be done includes the following:

Completion of the rehabilitation of the Alaska Northern Railway, including construction of snowsheds and enlarging of tunnels.

Construction of line from mile 237, ten (10) miles north of Talkeetna, to mile 365, five (5) miles north of Nenana Canyon. This is now the only gap in the line from Seward (mile 0) to Fairbanks, mile 471, with the exception of the bridge at Nenana, crossing the Tanana River, and a permanent bridge at mile 373 over the Nenana River. Completion of the dock at Anchorage.. A map showing progress on the railway will be found in Appendix C, page 218.

Col. Frederick Mears, shortly after his return from France in July, was appointed chairman and chief engineer of the Alaskan Engineering Commission. Mr. Wm. C. Edes has been appointed consulting engineer.

THE NATIONAL PARK SERVICE.

1. Continued and expanded the work of informing the public about the national parks and monuments under the jurisdiction of this service.

2. Prepared 185,000 and distributed about 167,500 circulars of information relating to these recreational areas.

3. Prepared and distributed approximately 86,000 automobile maps of the national parks.

4. Continued the circulation of large quantities of motion-picture film and lantern slides of scenes in the national parks.

5. Handled the largest volume of tourist travel in the history of the parks; 1919 season, 755,527; 1918 season, 454,841; 1917 season, 490,705; 1916. 358,006; 1915, 335,299; 1914, 240,193.

6. Automobile travel to the national parks during 1919 season, 95,140; 1918, 54,596; 1917, 55,296; 1916, 29,828.

7. Grand Canyon National Park created February 26, 1919, thereby adding this titanic example of erosion to the national park system.

8. Lafayette National Park created February 26, 1919, giving States east of the Mississippi their first national park, and establishing first national park on the seashore.

9. Investigated and reported on merits of Mount Evans section in Colorado as national park material.

10. Completed the improvement of Sitka National Monument in Alaska, which included the repairing and painting of all the great totem poles on this reservation.

11. Secured the repeal of the inhibition against expenditure of more than $10,000 per annum for Rocky Mountain Park, thereby paving way for greater development of that great scenic area.

12. Investigated status of lands in Hawaii National Park, and arranged for legislation which, when enacted, will assist in securing desirable private lands within park area by exchange of territorial lands.

13. Cooperated with highway and other associations in dissemination of information regarding parks and monuments.

14. Arranged for donation of block of land in city of Hot Springs, Ark., for location of free public bathhouse.

15. Installed a new water system in the Muir Woods National Monument.

16. Completed the road around the rim of the crater in Crater Lake National Park and trails from the road to Sun Notch and Crater Peak.

17. Established the feasibility of airplane travel to Yosemite and Rocky Mountain National Parks.

18. In cooperation with Smithsonian Institution conducted excavation and repair of ruins in Mesa Verde National Park.

19. Constructed new road in Mesa Verde National Park ascending the east side of Point Lookout, giving commanding view over surrounding territory.

20. Improved road through section of Petrified Forest National Monument, thereby opening up further area to visitors.

21. Made important repairs to Tumacacori Mission to preserve it from decay.

22. Made improvements in Casa Grande National Monument for better accommodation of visitors, and cooperated in archaeological investigations made there.

23. Completed trail to Forst's Cave in Shoshone Cavern National Monument, thereby opening up this natural curiosity to the public.

24. Cooperated with scientific societies in excavation work in Chaco Canyon and Gran Quivira National Monuments.

25. Engaged in cooperative work with the Bureau of Service, National Parks and Monuments, of the Railroad Administration, established in Chicago, to inform the public regarding railroad rates and tours to the national parks, monuments, and other resorts.

26. Established a course of lectures on the national parks and their attractions to be given each year in Yosemite National Park.

27. Furthered the establishment of museums in Yellowstone, Yosemite, and Rocky Mountain National Parks. Also at the Casa Grande Monument.

28. Completed new road in Gardiner River Canyon, Yellowstone National Park.

29. In cooperation with the Smithsonian Institution arranged for assembling of data for a book on the wild flowers and trees of Glacier Park, and with the Biological Survey and the University of Washington for a popular volume on the wild life of Mount Rainier National Park.

30. Cooperated with the National Parks Association, the Association of Mountaineering Clubs of America, and other organizations in the dissemination of information leading to a broader use and appreciation of the national parks.

31. Gave special attention to the conservation of the wild life of the parks and monuments, by reduction in number of predatory animals and establishment of game preserves.

32. Planted large consignments of fish in the lakes and streams of some of the larger parks, in cooperation with Federal and State commissions, in order to develop and maintain good fishing waters for tourists.

33. Conducted investigations of large tracts of land containing the redwood, with a view to the further conservation of this rapidly diminishing tree in national parks, and including the reservation of timber along public highways.

34. Collected $196,703.03 in revenues from the national parks.

35. Prepared new edition of popular pamphlet Glimpses of Our National Parks, and copy for Glimpses of Our National Monuments.

36. Established new department of landscape engineering for the harmonious development of the national park areas.

37. Surveyed lines for new roads and trails in Grand Canyon, Glacier, and other national parks.

38. Planned for the extensive enlargement of facilities within the park to provide adequate accommodations of every kind for the traveling public.

39. Planned comprehensive trail development for Yosemite National Park.

40. Started detailed survey of floor of Yosemite Valley.

41. In addition to above attended to repair and maintenance work in all the parks under funds provided.

ABSTRACT OF REPORTS OF BUREAUS AND OTHER ADMINISTRATIVE UNITS OF THE DEPARTMENT.

OFFICE OF THE SOLICITOR.

The following table shows the number of matters received and disposed of during the fiscal year ended June 30, 1919, which were docketed or recorded. It does not, however, account for a very large number of miscellaneous matters of which no formal record was kept.

Work of office of solicitor.

	Public lands.		Pensions.		Miscellaneous.[1]	Disbarments.	Summary.
	Appeals.	On rehearing.	Appeals.	On rehearing.			
Pending July 1, 1918	479	89	281	8	101	6	964
Received June 30, 1919	1,360	294	501	26	8,262	20	10,463
Total	1,839	383	782	34	8,363	26	11,427
Disposed of	1,410	300	677	28	8,278	22	10,715
Pending July 1, 1919	429	83	105	6	85	4	712

[1] Under "Miscellaneous" are grouped such matters as opinions, Indian matters, contracts, leases, etc. as well as many other varied matters arising in the several bureaus of the department and which, for one reason or another, may be referred to the solicitor's office for consideration.

From the above table it will be noted that out of a total of 11,427 matters docketed, only 712 were pending and undetermined at the close of the fiscal year; and that the total of each class shows a reduction over that of the previous year. This volume of work represents formal appeals and a great variety of miscellaneous matters coming from every bureau of the department. An additional class of work now also being submitted for consideration by this office is that arising under the law providing for relief in certain cases of contracts connected with the prosecution of the war, commonly known as the "War minerals relief act." Notwithstanding the great volume and variety of work of the office, it is now reached in docket order for consideration within a little more than two months after receipt. By such early disposition, after careful examination of records and thorough consideration of the questions involved, a substantial benefit is conferred not only upon the parties in interest, but also upon a great many others transacting business before the department in various ways dependent upon such adjudication.

The court work during the year shows highly satisfactory results. Three cases against the Secretary were decided favorably by the Supreme Court of the United States—in two, adverse judgments in the court of appeals having been reversed. The court of appeals decided seven cases in which the Secretary was involved. Of these, two (in one of which this office did not appear for the Secretary) were decided against the department. Eighteen cases were disposed of in the Supreme Court of the District of Columbia, in three instances adversely. In one of these the department took no appeal, leaving the decision final, and making the fourth case during the last 10 years where final judgment has been against the department. Another was a case not defended by this office. And the third, State of New Mexico *v.* Lane (being the one lost also in the court of appeals), is now pending in the Supreme Court of the United States, where it invites final judgment on the question, very important in the administration of public-land laws, as to when a State acquires a vested interest in land embraced in a selection list. Another interesting case decided at nisi prius involves the administrative ruling of February 15, 1917 (46 L. D., 32), construing the statutes governing soldiers' additional rights; with which construction the court agrees. Six cases have been argued and submitted, with no decision rendered at the close of the fiscal year. Eleven new suits were filed within the year. There are now pending: United States Supreme Court, 8; court of appeals, 4; Supreme Court of the District, 32; in all, 44. There are two other cases, decided in favor of the Secretary of the Interior by the court of appeals, potentially pending, where the right of appeal has not expired. Aside from these cases, this office represented the Government, unsuccessfully, in another case at the request of the solicitor general.

GENERAL LAND OFFICE.

Area of land entered and patented.—The total area of public and Indian lands originally entered and allowed during the fiscal year ended June 30, 1919, is 11,863,672.28 acres, not including 137,403.27 acres embraced in finals not heretofore counted as original dispositions of land. The latter area is constituted as follows: Public auction, 104,721.15 acres; abandoned military reservations, 7,509.29 acres; cash and private sales, individual claimants and small-holding claims, 14,090.26 acres; pre-emption entries, 86.26 acres; and soldiers' additional homesteads, 10,996.31 acres. The area of 11,863,672.28 acres is an increase of 1,889,340.67 acres, as compared with the area originally entered and allowed during the fiscal year 1918. This increase in allowed entries is due to the stock-raising homestead act of December 29, 1916, 5,559,235.11 acres having been allowed under that act.

The area patented during the fiscal year is 10,777,001.349 acres, an increase of 1,224,519.132 acres, as compared with the fiscal year 1918. Of the above area 8,312,318.888 acres were patented under the homestead laws, an increase of 1,819,521.072 acres, not including as homesteads 13,334.12 acres patented as soldiers' additional entries.

Cash receipts and expenditures.—The total cash receipts from the sales of public lands, including fees and commissions ($1,194,472.10), sales of reclamation town sites ($43,863.86), and sales of lands in the Oregon & California Railroad grant ($114,608.32), for the fiscal year 1919 were $2,817,063.27. The total receipts from the sales of Indian land were $1,387,781.74. Other receipts aggregated $98,829.19. The total receipts of this bureau during the fiscal year 1919 were $4,303,674.20.

The total expenses of district land offices for salaries and commissions of registers and receivers and incidental expenses during the fiscal year ended June 30, 1919, were $794,984.62. The aggregate expenditures and estimated liabilities of the public land service, including expenses of district land offices and surveys made from the appropriations for surveying the public lands outside of railroad land grant limits, were $3,026,554.46, leaving a net surplus of $1,277,119.74 of receipts over expenditures. Disbursements from the following special deposit trust funds and reimbursable appropriations are not included in the above figures as receipts or expenditures: From deposits by individuals for surveying the public lands, $47,020.65; from surveying within land grants (reimbursable), $12,572.36; from opening Indian reservations (reimbursable), $2,672.93; and from surveying and allotting Indian reservations (reimbursable), $54,705.49.

Field service.—As the result of investigations in the field, $101,298.96 were collected and turned into the United States Treasury; in addition to this sum, $10,944.41 have been placed in the Treasury as royalty on coal mined during the past year from a tract in Colorado, as well as $26,193.35 as royalty from a coal lease in Wyoming.

As a result of field investigations 164,363.83 acres have been restored to the public domain; of this acreage 85,323.83 acres were restored to open range by abatement of unlawful inclosures without suit.

Special agents have investigated and reported on 17,399 cases, 3,447 of which were adversely and 13,952 favorably reported. Two hundred and fifty-two hearings in Government contest cases have been held. Civil suits in 65 cases were recommended to the Department of Justice as the result of investigations during the year. Eighty-six were tried in court, of which 60 were won and 26 lost. As the result of the successful suits, $43,895.94 was recovered and

8,091.26 acres were restored to the public domain, of which 6,180 acres had been unlawfully inclosed.

Of the criminal cases tried during the year, 14 resulted in convictions, under which there were six prison sentences imposed and fines amounting to $1,000 paid.

The prevalence of forest fires on public lands is noted, and the expenditure of money from our appropriation for protecting the public lands as a consequence, and the urgent necessity of a special appropriation for protecting such timber from forest fires, as well as for the reimbursement of the fund for protecting public lands to the extent that it may have been depleted by this cause.

Oil land claims.—California: Referring to the Commissioner's annual report for 1917 for a full statement as to the situation in the oil fields in California and Wyoming in the matter of claims pending in the Land Department and before the courts, and the main questions involved therein, additional data is furnished in tabulated form necessary to bring the oil story up to date, as well as a summary of the present status of proceedings in the courts and in the department.

Wyoming: Additional withdrawals aggregating 98,018 acres were made during the fiscal year and 931 acres were restored as nonoil. On June 30, 1919, 1,180,987 acres were embraced within existing withdrawals. During the year 19 applications for patent, embracing 3,040 acres of land in the withdrawn area, were rejected, and patent was issued on one application embracing 32.22 acres. Patent also issued on two other applications outside of withdrawn area aggregating 100.16 acres. Ten new applications embracing 1,440 acres were filed, and at the end of the fiscal year 58 applications for patent embracing approximately 8,880 acres were pending.

Oil contracts.—At the end of the year there were 40 contracts under the act of August 25, 1914 (38 Stat., 708), in operation in California, embracing 4,165 acres. The production from the tracts covered by these contracts up to June 30 was 8,270,657.92 barrels of crude oil, 709,725,978 metered feet of dry gas, and 698,816 gallons of gasoline, the escrow deposits thereunder amounting to $1,152,523.48.

In Wyoming nine contracts, covering approximately 800 acres of land in the Salt Creek field, are in force, 27 contracts during the year having been discontinued on the increase of the escrow deposit called for. The total production in Wyoming under these contracts during the year was 9,545,131.20 barrels of crude oil; 286,836,682 metered feet of gas, the escrow deposits amounting to $3,172,482.36.

The total production in both California and Wyoming under these agreements has resulted in escrow deposits of $4,325,005.84.

Operations on two 40-acre tracts in the Grass Creek Field held under State leases not covered by agreements under the act of Au-

gust 25, 1914, have resulted in an escrow deposit under special agreement of $2,119,306.58.

Under arrangement with the operators in California and Wyoming, including those operating in Grass Creek, under lease from the State, $1,192,400 of the escrow deposits were invested in Fourth Liberty loan bonds and $1,436,750 in Victory loan notes, which, with the $2,114,850 theretofore invested in Liberty bonds of the first three issues, makes a total of $4,744,000 so invested.

"Ferry" or "Caddo Lake" oil lands in Louisiana.—The pendency of litigation on behalf of the United States in the United States District Court, western district of Louisiana, of 18 suits involving the "Ferry" or "Caddo Lake" oil lands was mentioned in his prior report with a brief statement of the facts leading thereto. These suits came up for trial during the spring and summer of 1918. The total amount which the Government sought to recover in the 18 suits was $614,942.27 and nearly 100 parties, including a number of leading oil companies, were made defendants. On January 11, 1919, the master in chancery filed his report in 17 of the suits recommending decrees in favor of the Government, quieting title to the lands and awarding damages in excess of $400,000. In the other suit an award favorable to the Government was made with damages to the amount of $62,581.85. The findings of the master were sustained in a decision handed down by the court July 15, 1919. By this decree the Government has its title to approximately 617 acres of oil lands quieted and obtains possession of 23 producing oil wells, and is awarded the sum of $462,903.39.

An additional suit has been instituted on the recommendation of the Land Department against certain companies to quiet title to alleged unappropriated, unreserved public lands and to recover the sum of $317,919.38, the value of oil extracted therefrom.

Arkansas "sunk and lake lands."—Since the issuance of the last annual report the work relative to these lands has been largely in the nature of a cleaning-up process. After the decision of the United States Supreme Court, November 5, 1917, in the case of Lee Wilson & Co. against the United States, the Government was enabled to proceed rapidly with the prosecution of its recovery of these lands, and the past year has witnessed the accomplishment of a large amount of work in that direction. A favorable decree was obtained by the Government on June 25, 1919, in the United States District Court, Eastern District of Arkansas, in the case of United States against Chapman & Dewey Land Co. et al., by which the title was quieted in the United States to an area of approximately 54,000 acres, largely agricultural and timbered lands said to be worth about $50 per acre, or $2,700,000.

On June 21, 1919, the Government also obtained a decree in the same court in the case of the United States against John W. Walker et al., involving approximately 700 acres of land. This case is important on account of its value as a precedent. The commissioner makes a full statement of the work accomplished in this field and adds that besides the recovery of the lands noted the Government has also collected and covered into the United States Treasury $48,719.97 for timber cut in trespass and removed from the lands.

The lands involved in these proceedings were erroneously omitted from the original surveys and have now been restored to the public domain, and most of them are at present included in homestead entries. To date 165 patents have been issued placing the title to about 19,000 acres in private ownership.

Surveys.—The accepted surveys and resurveys for the fiscal year ended is 7,668,514 acres.

The act of September 21, 1918 (40 Stat., 965), provides for an enlargement of the resurvey work, the Government being thereby authorized to resurvey townships heretofore held to be ineligible for resurvey on account of the excess private ownership therein. Suitable regulations for procedure under the terms of this act have been promulgated.

The work of the eastern surveying district includes the miscellaneous fragmentary public lands surveys and examinations and Indian surveys in those States where the former United States surveyor general's offices have been discontinued and the work in this field has been unusually active and productive of results during the year that is past.

Special attention is also called to the surveys in Alaska, with a sketch of their progress from point to point, in order to anticipate the needs of settlers and the development of the territory, particularly in view of the country already opened up by the construction of the Government railroad and the future progress of this enterprise.

The showing made in the offices of surveyors general is especially commended by the commissioner on account of the large reduction of arrearages accomplished in several of the States. Attention is called to the controversies that have arisen over lands lying along Red River where it constitutes the boundary between Oklahoma and Texas. The discovery of oil in this neighborhood has given a sudden value to these lands and the boundary questions will probably be settled in the courts, as the United States has already instituted proceedings for the protection of the rights of certain Indian allottees as riparian owners to adjacent lands.

Drafting and map making.—The edition of the 1919 United States map was only 8,519 copies, while that of the 1918 edition was 15,000 copies, the difference being due to the increased cost, owing to ad-

vancing outlay for labor, muslin, paper, and other materials. The cost of the 1918 edition was $1.04 and that of the 1919 edition was $1.90 per map. A larger appropriation for the production of the United States map is necessary to provide the number called for by Congress and for the commissioner's use.

Tract-book notations.—The total number of notations for the year was 376,151. This includes 719 Indian allotments, 12,188 petitions to designate under the acts of February 19, 1909, and December 29, 1916; and 48,079 patents. The number of plats posted was 1,037.

Homesteads, desert entries, timber and stone applications, and kindred applications, were given a preliminary examination, embracing in total 32,193, of which number 24,498 were accepted, and 7,695 held for further action on account of conflicts and for defects of various kinds.

Supplemental patents under the act of April 14, 1914, authorizing such issue on reclassification of lands showing their noncoal character were issued in 1,898 cases.

Homestead and kindred entries.—There were approved for patenting 33,247 homestead entries on which final three or five year certificates had issued, 2,300 commuted homestead entries, 1,883 final homestead entries within national forests, 453 timber and stone entries, and 2,248 miscellaneous cash entries, a total for the year of 40,131 as against 32,120 of the previous year. Applications to make second homestead entries were allowed aggregating 2,792, while 1,097 were denied; 1,224 applications to amend were allowed and 270 denied; 2,108 applications for the sale of isolated tracts were approved, 713 denied.

Stock-raising homesteads.—The commissioner reports satisfactory progress in the matter of designating lands subject to this form of entry, and the allowance of entries therefor. The area of stock-raising lands designated to date is 20,181,868 acres. During the year 14,248 petitions were received asking for the designation of land under the act, and 22,000 petitions of such character received favorable consideration; the whole number of petitions filed asking for such designation since the passage of the act is 48,897. During the year now past the total number of entries allowed under this act were 15,037, covering an area of 5,559,235 acres.

Stock driveways.—The commissioner states that since his last annual report field investigation under the applications of stock men and recommendations of the Forest Service for stock driveways in Nevada and New Mexico has been completed. This work is also completed in South Dakota, Colorado, Montana, Oregon, Washington, and Wyoming, with the exception of certain investigations of incomplete applications or of areas heretofore temporarily withdrawn for such purpose pending further investigation. A few appli-

cations remain to be investigated in Arizona, California, and Idaho; field investigations are progressing satisfactorily upon the remaining applications in Utah. The total area withdrawn for stock driveway purposes at the close of the fiscal year is 6,623,531 acres.

Soldiers' additional homestead rights.—Attention is called to the administrative ruling of June 13, 1919, by the Secretary of the Interior, in which it was directed that the rule of approximation will no longer be permitted in the location of soldiers' additional homestead rights, whether in their entirety, partly, or in combination with their rights or parts thereof. This rule becomes effective December 1, 1919. It was made necessary by the character of the applications of late years, largely made up of small fractions combined under the rule of approximation so as to obtain title to 40-acre tracts by the location of a little more than 20 acres of soldiers' rights and paying the Government price for the excess.

More than 60 per cent of the new applications have been made for lands in the grazing region of California, Nevada, and Wyoming, apparently to obtain control of springs and water holes used by the general public for watering stock on the public range. These applications are all investigated carefully and the lands embraced therein withdrawn for public water reserves if the public need demands such action.

Town-site, town-lot, and kindred entries.—Nineteen town-site and kindred entries were received during the year, amounting, with the four pending at the beginning of the year, to 23, of which number 20 have been approved for patenting, leaving 3 pending.

At the beginning of the fiscal year 112 lot entries were pending, and there were received during the year 1,208, making a total of 1,320 lot entries, of which number 1,251 were approved for patenting, leaving 69 pending at the end of the year. These entries include 1,288 lots.

During the fiscal year there has been received for the sale of town lots outside of Alaska $112,871.30.

The receipts from sales of lots in town sites in Alaska under the railway construction act of March 12, 1914, amount to the sum of $28,099.65. Other sales in Alaska under the act of March 3, 1891, have been made in the town sites of Wrangell, Haines, and Douglas. The proceeds from Douglas amount to $1,257.06, and from Haines $2,118.20. The trust for the town site of Wrangell has not been completed.

Rights of way.—During the year there were received 430 applications for rights of way of all kinds, of which 81 were for railroad rights of way and 349 for "all others," excepting hydroelectric power projects.

During the year 185 cases have been docketed looking toward the forfeiture of rights of way where there has been no construction

within the statutory period. One hundred and five cases of this kind were finally disposed of in the past year, of which number nine were declared forfeited by decree of court after judicial proceedings, and the balance by relinquishment or otherwise.

State irrigation districts.—In accordance with the act of August 11, 1916, and the regulations thereunder, there have been filed five applications, three in California, one in Oregon, and one in Idaho, involving 131,148 acres of public land, which it is sought to bring under the taxing power of the State, through the approval of the applications by the Secretary of the Interior.

Private irrigation projects.—Sixty-one new reports and 28 supplemental reports have been received as a result of investigations of private irrigation enterprises, and irrigation districts, upon which claimants and applicants under the desert-land laws are dependent for their water supplies, making a total of 978 projects investigated since the adoption of this form of procedure to determine the feasibility of alleged projects.

Hydroelectric power.—During the past fiscal year two permits were granted under the provisions of the act of February 15, 1901, and during the year seven rights of way under the act of March 4, 1911, were also granted.

For the use of public lands under permits and grants for hydroelectric power development, power-transmission lines, etc., the sum of $8,137.07 was collected.

Carey Act.—Of the 264,533 acres for which applications for patent were either pending or received during the year, 85,699 acres have been patented and 5,460 acres disallowed, leaving 173,365 acres pending at the present time.

Withdrawals and segregations made during the year total 3,532 acres, and restorations during the same period, 565,899 acres.

Desert land.—During the fiscal year 1,675 final desert-land entries were patented, involving 267,065.22 acres.

Reclamation homesteads.—Six hundred and fifty-three final homestead entries under the reclamation act of June 17, 1902, were approved for patenting.

No large opening of farm units occurred during the past year. About 23,000 acres formerly embraced in the Sun River project, Montana, were restored to homestead entry.

Withdrawals were made during the year for the Sentinel project, Arizona; Bruneau and Mountain Home projects, Idaho; Oregon Basin project and Riverton project, Wyoming. The total area of lands withdrawn during the year was 3,868,840 acres, while the area restored was 120,240 acres.

Stock-watering reservoirs.—Applications for 20 stock-watering reservoirs were approved during the year; 205 are yet pending, of which number 133 are awaiting response to calls and 72 office action.

Withdrawals and restorations.—During the past year 9,793,525 acres of public lands were withdrawn or placed in the state of reservation under the various acts applicable thereto, and 4,978,403 theretofore withdrawn have been restored. Some of the withdrawals overlap in part former withdrawals for other purposes, and some are in the form of blanket withdrawals, without strict regard to lands entered or applied for, so that the total of withdrawn lands does not represent accurately the amount of public enterable lands withdrawn. The same may be said of restorations. Under this head the commissioner's report furnishes a tabulated statement.

State selections and State grants.—Indemnity school-land selections aggregating 472,090.33 acres, and selections under grants in quantity embracing 87,080.04 acres, were received during the year. There were certified to the States during the same time 1,277,909.11 acres of indemnity school land and 350,925.46 acres of quantity grant land. Under the several acts of Congress authorizing certification to the States with reservations of mineral deposits to the United States 53,025.12 acres have been thus certified. The commissioner calls attention to the cooperative agreements entered into between the United States and some of the States under which school lands within the boundaries of national forests are exchanged for other lands within forest boundaries, the lands so selected by the States upon confirmation of title being eliminated from the forest; the total so far confirmed to the States under these agreements amounts to 203,750.80 acres.

School grant to the State of Washington.—The controversy between the State of Washington and the Land Department as to the applicability of the act of February 28, 1891, to the school grant made to the State of Washington has been made the subject of an agreement by which the representatives of the State undertake to institute or cause to be instituted and prosecuted to the supreme court of the State and, if deemed advisable, to the Supreme Court of the United States without delay, such legal actions as may be appropriate to obtain decisions on the disputed question. Pending this determination action on some 85,000 acres of selections is withheld.

Railroad grants.—Railroad and wagon-road selections were received during the year to the amount of 529,900.03 acres as against 665,372.49 acres in 1918.

There were patented 632,284.40 acres as against 943,399.78 acres in 1918.

The suit referred to in the commissioner's report of 1918 as having been instituted against the Southern Oregon Co., successor in interest to the Coos Bay Wagon Road grant was settled under authority of the act of February 26, 1919 (40 Stat., 1197), the company executing its deed of reconveyance for some 93,000 acres of land for which the

United States paid $2.50 per acre and became responsible to the State for the taxes due and unpaid on said lands estimated at over $547,000. These lands will be disposed of in accordance with the act of June 9, 1916 (39 Stat., 218), providing for the classification and disposition of the lands formerly included in the Oregon & California Railroad grant.

The adjustment of the grant to The Dalles military road under the decision of the department dated January 24, 1917 (45 L. D., 613), wherein it was held that the actual location of the road as constructed defined the limits of the grant and not the diagram theretofore used in adjusting claims thereunder is well under way and the resulting deficiency of 36,066.55 acres is being made good from the limits as thus ascertained.

Practically all of the Oregon & California grant lands revested in the United States by the act of June 9, 1916 (39 Stat., 218), have been classified, except the unpatented lands in the primary limits within forest reserves, approximately 400,000 acres, although this area will be reduced to the extent that the lands are found to be mineral in character. About 472,000 acres, of which 318,000 acres are unsurveyed in the indemnity limit within national forests, are also unclassified. Under present rulings the right of selection by the company of these lands is defeated. Under the adjustment required by the act of revestment it became necessary to survey approximately 182,000 acres of land in the primary limits and in the indemnity limits outside the forest reserves. This survey is now nearly completed.

Timber on isolated tracts of the Oregon & California revested lands, aggregating 2,875.76 acres, has been sold this year, amounting to 65,414,000 feet board measure, for which there was received the sum of $96,497.83. The act of May 31, 1918 (40 Stat., 593), authorizes the Secretary of the Interior in handling the revested Oregon & California lands to exchange such lands for other lands of approximately equal aggregate value held in private ownership either within or contiguous to the former limits of the railroad grant, when by such action he will be enabled advantageously to consolidate the holding of the timberlands by the United States. A number of applications proposing exchanges under this act, involving approximately 80,000 acres of land, have been received and are now under process of consideration in the office and the field.

Swamp and overflowed lands.—The total area conveyed to the several States the beneficiaries under this grant up to July 1, 1919, is 63,906,694.83 acres.

The commissioner renews his recommendation that legislation be enacted declaring that after a fixed date, preferably six months after

the passage of the act, no new claim to swamp and overflowed lands made by any State shall be received.

Claims in Texas.—During the last year several applications have been made to the commissioner calling for the exercise of jurisdiction of the Land Department over lands within the State of Texas, each of which was denied, and on appeal it was held in the department, June 12, 1919, that the United States had no jurisdiction over public lands or private land claims in Texas and dismissed such applications.

Abandoned military reservations.—The commissioner reports a number of probable sales for the ensuing year with items of interest in connection therewith, especially in the case of Fort Sabine, in Cameron Parish, La., where the lands have a special value on account of their proximity to the Beaumont oil fields.

Indian allotments.—Trust patents have been issued during the year on 2,433 allotments, covering a total area of 395,539.95 acres. With the exception of large reservations in New Mexico and Arizona and the mission reservations in California, the great bulk of lands held in common by the several tribes has now been divided among the individual Indians entitled thereto.

Chippewa logging operations.—During the last year 1,524,120 feet of timber were cut under the provisions of the act of June 27, 1902 (32 Stat., 400), for which the purchasers paid $9,030.62. The total amount cut up to July 1, 1919, under this act is 1,283,025,956 feet, for which the purchasers have paid $9,084,839.44.

Minnesota drainage.—During the year there have been approved for patenting 1,118 entries subject to drainage taxes under the Volstead Act of May 20, 1908 (35 Stat., 169), covering approximately an area of 176,320 acres, as against 146,240 acres the previous year. A total area of 766,920 acres have been patented under this act.

Sale of Indian lands.—Within the former Flathead Indian Reservation 4,356.24 acres near Kalispell, Mont., were offered for sale June 20, 1919, and 9,586.05 acres within said reservation, situated in the Missoula land district, were offered for sale June 26, 1919. The lands were listed in tracts embracing from 40 to 160 acres each. Fourteen of the 48 such tracts of the Kalispell lands sold for $2,466.85, and 16 of the 129 such tracts of the Missoula lands sold for $2,029.73.

Twenty-six tracts of land within the former Sioux Indian Reservation, S. Dak., embracing from 40 to 160 acres each, were offered for sale at Pierre, S. Dak., and sold under the act of March 4, 1915 (38 Stat., 1189), for the sum of $4,818.08.

Mining claims.—The total area embraced in approved mineral entries for the year was 32,559.774 acres, for which the sum of

$137,381.09 was received; in approved coal entries 7,843.17 acres, for which $295,031.75 was received.

An Alaska coal-land lease of blocks 49 and 50, Bering River field, comprising 2,080 acres, was issued during the year, making a total of 4,500 acres under lease in that field. In the Matanuska field no new areas have been leased. There are now in this field 2,840 acres under lease. No leases have been made in the Nenana field.

During the year leases of potash lands in Searles Lake, Calif., were completed, covering a total of 12,760 acres in 9 leases; another lease for 980 acres of the lake bed has been authorized. Applications for permits to prospect for potash were received to the number of 208 during the year, making a total of 494 applications received altogether. Ninety-three permits to prospect were issued, making a total of 102 permits issued, of which number two have been canceled.

National forests.—There are now 151 national forests, embracing 174,261,393 acres, of which a little over 88 per cent is public land. The net decrease in national forest area since the beginning of the fiscal year is 1,689,873 acres. During the year 1,658,988 acres have been excluded from national forests, 609,925 acres thereof reserved or withdrawn for certain public purposes, and the public lands in the remaining 1,049,063 acres and in 166,875 acres released from temporary or other withdrawals for forest purposes, have been restored to entry and other disposition.

Forest lieu selections.—The decision of April 1, 1918 (46 L. D., 341), in the case of F. A. Hyde & Co., held as to lands in California that if a patent issued to a real person the fact that such patent was fraudulently procured was immaterial if the State had taken no steps to rescind such patents when it was in a position so to do, and was thereafter barred by the statute of limitations. As a result of this decision this class of cases has been practically closed out, and there now remains of the California cases but those wherein it was charged by the Government that the patentees of the State were fictitious persons, and a consolidated hearing as to these cases has been held at San Francisco resulting in 53 cases being returned to the department under remanding orders, 16 being rejected in this office subject to appeal and 31 now awaiting action.

Selections based on lands the title to which was secured from the State of Oregon have been suspended to await the result of suits instituted by the State to cancel patents issued by it on fraudulent representations. The State has been successful in many of these suits and copies of decrees canceling State patents have recently been received, upon which action will be taken as soon as practicable.

Nineteen forest lieu selections have been patented and 50 canceled during the year.

Lieu selections for lands in Indian reservations.—The act of April 21, 1904 (35 Stat., 211), authorizes selections of public lands in New Mexico and Arizona in lieu of lands in Indian reservations. On June 6, 1916, the department decided not to allow any further exchange under this act unless in exceptional cases. Two such cases have recently arisen, the first of 47,056.75 acres in the Laguna Pueblo Reserve, owned by the Santa Fe Pacific Railroad and the New Mexico & Oregon Land Co., and the second of 37,243.63 acres of Zuni lands, of the Santa Fe Pacific Railroad Co.

Contests.—During the year litigation in the land office aside from questions incident to the adjustment of grants and the prosecution of claims for title is well in hand. Ten thousand and seventeen such cases were the subject of final decision as well as 1,654 cases that were dismissed for failure of prosecution on the part of the contestant or in default of answer by the defendant.

Repayments.—Under the several statutes authorizing repayments there were stated during the last fiscal year 762 accounts, allowing repayment of $80,896.70, and during said period there were denied 285 claims for repayment. Of this number of claims allowed and the amount repaid 91 are accounts allowing the repayment of $17,601 received in connection with the sale of various Indian reservation lands and repaid from Indian trust funds.

INDIAN AFFAIRS.

Releasing Indians from Government supervision.—The effect of the new policy issued April 17, 1917, is clearly shown by the fact that under the acts of Congress approved May 8, 1916, and June 25, 1910, 9,894 fee patents were issued to Indians in the 10 years from 1906 to 1916, while during the last 3 years 10,956 fee patents have been issued, amounting to an increase on the average annual issuance of 2,663 fee patents under the operation of the new policy.

Within the year, 4,376 fee patents were approved, involving an area of 778,698 acres.

On March 7, 1919, an order was issued calling for lists of all Indians of one-half or less Indian blood, who are able-bodied, mentally competent, and 21 years of age. Under this broadening of the policy it is estimated that 4,500 additional fee patents will be issued.

Attention is being given to the clearing up of inherited estates, of which there are approximately 20,000, and detailed instructions have been issued to the Field Service for settling these estates by partition or sale of the land and issuing fee patents to the heirs wherever practicable under the policy of April, 1917, which will further increase the number who will be no longer wards of the Government.

Citizenship.—The question of Indian citizenship has become of foremost interest, and has been the subject of several bills recently introduced in Congress.

As far back as 1817, provision was made in a treaty with the Cherokees by which any member of that tribe who desired might become a citizen of the United States. Subsequent treaties and acts of Congress contained provisions by which members of other tribes might become citizens.

The question whether under the Fourteenth amendment to the Constitution an Indian could, by severing his tribal relations, and completely surrendering himself to the jurisdiction of the United States, become a citizen thereof was determined in the negative by the Supreme Court in Elk *v.* Wilkins (112 U. S., p. 100).

No general law provided a means for citizenship of all Indians until 1887 when Congress passed the general allotment act (24 Stats. L., 388), which provided for the allotment of lands in severalty and declared all Indians born within its limits, who shall have complied with certain conditions, to be citizens of the United States. The broad citizenship provisions of this act were modified by Congress when on May 8, 1906, it passed the Burke Act, since which law the issuance of a fee patent has been the primary legal requirement for citizenship of Indians. It is believed that the controlling factor in granting citizenship to Indians should not be based upon their ownership of lands, tribal or in severalty, in trust or in fee, but upon the fact that they are real Americans and are of right entitled to such citizenship.

War as a civilizer.—Few things more helpful have come to the Indian race than the enrollment of 10,000 of its sons as American soldiers to challenge the barbarous rule of central Europe. Mingled indiscriminately with white troops, the Indians of necessity learned their language besides having equal opportunity with them for observation, for maturing judgment, and developing courage through contact with events and conditions that trained and toughened character in defense of a just cause and a great ideal. Many reports from superintendencies are in line with the following:

A number of full-blood Cherokees lately returned, none of whom could speak a word of English on entering the service, now talk English fluently.

I do not know of a single case where the returned Indian has not benefited, mentally and physically, to a degree plainly noticeable and commented upon by the whites of his community.

Five of these soldier boys returned recently from their work in France with a broader outlook on life and a desire to do something creditable to themselves and their people.

Those who have returned to the reservation show amazing progress in many ways—self-reliance, industry, personal habits, and proper respect for authority.

The refusal of your office to permit the segregation of Indian troops was of the greatest benefit, resulting in most cases in but one Indian to a company of

white soldiers and thus compelling them in every way to take up the life and manners of the white man. I safely say that our returned soldiers now constitute the best type of young Indian manhood.

He has greater self-confidence. He realizes that there is a place for him in the community; that he is a unit in the great Commonwealth.

The distinguished-service record of the Indian was probably not below that of any other people engaged in the war. He bears his honors modestly, which prevents definite information regarding many cases of individual valor. From instances cited in a partial list it is doubtful if a more brilliant one stands to the credit of any soldier than the achievement of Pvt. Joseph Oklahombi, a full-blood Choctaw, of Oklahoma, who received the croix de guerre under an order of Marshal Petain, a translation of which follows:

Under a violent barrage, dashed to the attack of enemy position, covering about 210 yards through barbed-wire entanglements. He rushed on machine-gun nests, capturing 171 prisoners. He stormed a strongly held position containing more than 50 machine guns and a number of trench mortars. Turned the captured guns on the enemy and held the position for four days in spite of a constant barrage of large projectiles and of gas shells. Crossed "no man's land" many times to get information concerning the enemy and to assist his wounded comrades.

Education.—The Indian schools accomplished their full work under the course of study with but slight exception, although vacancies occurred in many important positions owing to war-time conditions. Such deficiencies as prevailed were due more to the per capita allowance of funds, which was not proportionate to the advanced cost of supplies, than to other causes.

In order further to increase the attendance of Indian children in the public schools, where such schools are available, and to require well-to-do and citizen Indians to defray the cost of their children's education, the school rules were amended with a view to eliminating certain classes and thus affording better provisions for those in greater need of Government aid. Under the amended rules—

There shall not be enrolled in Government nonreservation schools any Indian children who are not under Federal supervision without prior authority from the Commissioner of Indian Affairs.

There shall not be enrolled in any Indian reservation boarding or day schools any Indian children not under Federal supervision, except such as are entitled to share in the benefits of treaty or trust funds from which the school is maintained, without prior authority from the Commissioner of Indian Affairs.

Except as to reservation schools supported from tribal funds or under specific treaty stipulations, Indian pupils who have ample financial resources or whose parents have such resources sufficient for payment of all or part of the expenses of the pupil's education, whether or not the parents are wards of the Government, shall be required to pay their transportation, and all or part of the actual cost of their support and education, not to exceed $200 a year, or at the rate of $20 a month for a fraction of a year. Superintendents will enforce this regulation.

The purpose is to push actively the policy of reserving the Indian schools for children who are not provided with adequate free schools facilities and to pay tuition for those who have access to public schools but whose parents are wards of the Government.

Under this policy it was practicable within the year to discontinue 10 boarding schools and a number of day schools, which will result in better schooling for the more needy, ample care for those who attended the abolished schools, and a more economical administration.

Owing to abnormal costs of labor and material, construction of new school plants was impeded during the year and projects of this nature were conducted in open market at a saving over contract work of approximately 40 per cent.

Indian fairs and Indian exhibits at county and State fairs are adjunctively growing features of education. Fostered by certificates of merit and prizes, much is thus learned industrially, and the "better baby show," now a prominent feature, is a distinct impetus to better health.

Employment of young men and women in various lines of commercial, agricultural, and mechanical work was greatly extended, and now supplements the schools with practical training of importance that foretells economic stability and progress among the Indians.

Health.—Except for the epidemic of influenza and the sorrows of that severe visitation the health record of the Indians for the past year could be written as normal, notwithstanding the impairment of the service by the heavy loss of both physicians and nurses in response to war demands. But the great pandemic was on the whole efficiently resisted by great personal effort and sacrifice on the part of the field personnel generally. Many localities were handled with splendid results, and in one of the largest schools not a single case developed among 600 pupils and employees.

The health problems among the Indians are essentially the same as in rural communities and school assemblies. The service emphasizes those things which prevent disease and aims to secure better housing, better water supplies, better bodily nutrition, the practice of hygiene, sanitation, and well-ordered living. Constant effort is made to promote Indian industry in general and particularly farming. Agriculture and thrift are regarded as the pillars of a health arch of which sanitary education is the keystone. Work and prosperity lead to health and happiness.

With the resumption of normal conditions, definite health plans will be carried forward under thorough organization in districts requiring special attention.

Suppression of the liquor traffic.—The liquor forces continue to violate the law wherever it seems possible to acquire huge profits. The year has been an active one, notwithstanding the war restrictions

against the manufacture and sale of liquor. There were 1,516 new cases instituted during the year, 2,135 cases disposed of, 33,924 gallons of various kinds of intoxicants seized and destroyed, and 112 automobiles engaged in the illegal traffic libeled and sold for $42,869. The year's operations covered 27 different States, and include prosecutions for violations of State, Federal, and municipal laws.

An investigation of complaints that Indian Service officers were destroying unfermented grape juice in large quantities in Minnesota disclosed that many carloads of California grapes were being shipped into the territory covered by the Indian treaty containing prohibition against intoxicating liquors, but that they were not being used for making the ordinary form of "grape juice." Thousands of gallons were destroyed, but no action was taken against any person using grapes for ordinary unfermented grape juice.

The value of prohibition to the La Pointe Indians appears in information indicating that from the date it was effective, July 1, 1918, the total arrests for the next 6 months in the city of Ashland, Wis., were 236, as against 1,366 for the last six months of the wet period.

Farming and stock raising.—Upon the assumption that postwar conditions would require increased production to satisfy foreign and domestic demands, with as little soaring of prices as possible, the Indian field service was urged early to renew and stimulate for greater results the previous year's campaign. Emphasis was given to early preparation for the seedtime; the necessity for garden culture, the raising, drying, and canning of vegetables and fruits for home consumption as a measure of releasing other products for market, and especially to the extension of cultivated lands by the Indians. Responsive reports were encouraging from nearly every quarter, indicating that the high standard of war-period production would be maintained and in many localities surpassed.

Barring such unforeseen visitations as hailstorms, drought, and grasshoppers the crop results of the past year will be highly satisfactory throughout the Indian country. A most encouraging element is the greater use of agricultural machinery and a tendency to adopt modern improved methods of tillage.

In cotton-producing sections high-grade Pima seed has been furnished Indian farmers, and their crops are comparing well with those of the best white farmers.

The Indians have made continued progress in the live-stock industry even against the occurrence of successive droughts in some sections. They are showing special interest in the improvement of breeds by the purchase of first-class sires.

In addition to the natural increase there were purchased during the year approximately 3,200 cows and heifers and 450 steers. The

suppression of contagious diseases has progressed satisfactorily, and on several reservations in the Northwest, ranges are reported to be free from infected animals.

Irrigation.—Much allotted land of minors and adults who, from age or other disabilities, can not cultivate their entire holdings, is leased on favorable terms to white farmers, and production thus increased with profit to all concerned.

Advanced cost of labor and material for irrigation construction has been measurably offset by the greater use of machinery, such as dredges, dragline excavators, ditch cleaners, etc., thus also overcoming labor scarcity. The Yakima, Wash., project has been extended, and with new land under cultivation the gross yield was approximately $9,000,000. The Fort Hall, Idaho, Reservation will surpass previous years in products by irrigation, and in Montana the Crow lands under ditch tided that country over great drought severities.

The Fort Belknap Reservation in Montana is an example of progressive irrigation methods by the Indians who do practically all of the farming.

Additional wells have been installed in the Papago country, and, with the operation of the old ones, further increases the stock-raising industry, which is the chief means of support.

The water problem of the Navajo and Hopi in Arizona and New Mexico is slowly yielding to solution by the sinking of wells to supply drinking water for herds in areas of pasture that would otherwise be wasted. There are now 1,000,000 sheep and goats on the reservation of these Indians, and with sufficient funds, thousands of acres, affording reasonably good forage, can be utilized to increase their herds.

Aid has been extended to the Pueblo of New Mexico, and sanitation in their villages has been improved in some instances by the installation of domestic water supply, drainage, and sewer systems.

Allotment, sale, and leasing of land.—On the Gila River Reservation in Arizona 1,213 allotments of irrigable and nonirrigable land were made during the year, also 270 allotments, of 80 acres each, were made on the Umatilla Reservation, Oreg., and approximately 1,000 reallotments were made, under provision of law, on various reservations.

Allotments were made to 16 Indians in various national forests, and a total of 315 allotments, comprising 46,207 acres, were made on the public domain.

During the year 907 pieces of Indian land, covering 115,367 acres were sold for $2,803,232, an average of $25.65 per acre, the highest average price ever received from like sales.

The leasing of agricultural land in excess of the amount the Indians can cultivate was continued with good results, particularly on

the Uintah and Ouray Reservation in Utah, where the leasing of about 70,000 acres of irrigable allotted land was practically completed as a measure of saving the Indians' water rights which, under the law, would have been forfeited by the close of the year in default of making beneficial use of the water.

The Five Civilized Tribes.—To date of June 30, 1919, 3,578,934.38 acres of tribal land had been sold for $20,376,096.27, being $4,536,108.67 more than the appraised value. The estimated total value of unsold tribal property of the several tribes is as follows:

Choctaw and Chickasaw Nations	$17,689,720
Creek Nation	172,200
Seminole Nation	38,900

Only one tract of 10 acres of the Cherokee Nation remains unsold.

During the year a competency commission visited the Creek Tribe at their homes to determine who are capable of handling for themselves all business transactions affecting their allotted lands. Restrictions on 57,000 acres of allotted land were removed.

Money was disbursed to individual Indians last year from land sales, equalization, royalties, and per capita payments amounting to $7,812,331.44, an increase of more than three millions, and houses, barns, improvements, equipments, and miscellaneous articles were constructed and purchased at a total cost of $1,110,618.53. The Indian farmers responded beyond expectations to the emphasis laid upon agriculture and stock raising, and the Five Tribes scored a splendid record in the purchase of Liberty bonds, war savings stamps, and the number, estimated at 4,000, who were in military and naval service.

The Indian exhibit.—The Indian exhibit at the Interior Department Exposition held in May, 1919, consisted of enlarged photographs showing the educational and industrial progress of the Indians; how they helped to win the war by service in the Army and Navy, the purchase of Liberty bonds, Red Cross work, and food production. Specimens of native Indian handicraft, such as beadwork, hand-embroidered garments, artistic designs in laces and bags, and various similar articles made by Indian pupils, were shown; also canned and preserved fruits and vegetables, and many interesting products of the domestic science and art classes and the mechanic art shops of the Indian schools.

Forestry and road work.—The larger timber sales of the year were the eastern division unit, on the Tulalip Reservation, consisting of 65,000,000 feet; the Omak unit of 25,000,000 feet, on the Colville Reservation; the Stinking Lake unit, 25,000,000, on the Jicarilla Reservation; and the Northern Spring Creek unit, of 26,000,000, on the Klamath Reservation. A sale of 6,000,000 feet, known as the Big Bend unit, on the Klamath, was made late in the year, and the

Camas Creek unit, of 24,000,000 feet, on the Flathead Reservation, was advertised for the receipt of bids on July 15, 1919. The Apache Lumber Co. has been engaged in erecting a large mill within the area purchased by it on the Fort Apache Reservation in 1917. Approximately 30,000,000 feet have been cut under the contract of the International Lumber Co. on the Red Lake Reservation. A more intelligent and comprehensive system of laying out and maintaining highways on the reservations is being developed under the congressional appropriation available for this purpose, and as the Indians are more and more appreciating these essentials of modern economical development greater progress is anticipated. Indian labor is largely employed for road work, with the exception of the necessary experienced supervision, for which white foremen must be used.

Probate work.—Under congressional limitation of probate attorneys to matters affecting restricted allottees or their heirs, individual cases are receiving more effective attention. This work in Oklahoma, which for part of the year was retarded as a result of diminished service caused by the war, is proceeding normally.

Steps will be taken to test the constitutionality of a recent act of the Oklahoma Legislature changing the rules of probate procedure, which previously as adopted by the State supreme court had been uniform, to a system authorizing each county judge to promulgate rules governing the procedure in his court. The new plan, permitting each of 40 counties to have a different set of rules, if sustained, will severely cripple the bureau's probate organization.

During the year attorneys appeared in 7,624 regular cases, instituted 270 civil actions, involving $268,638, and finally determined 232 civil actions, besides attending to a large volume of other probate work.

In the probating of estates of deceased Indians outside the Five Civilized Tribes, 2,414 cases were finally disposed of. One thousand eight hundred and eighty-seven of these related to estates under trust patents, 176 to restricted-fee patents, 51 to personal property, and 97 to inherited interests. One hundred and eighteen will cases were received, 75 of which received action. Fifteen examiners of inheritance held hearings in 26 reservations. Miscellaneous cases pertaining to probate work to the number of 2,914 were also disposed of.

Mineral interests.—During the year oil leases on certain lands of the Osage Indians aggregating 95,337 acres were sold for a bonus consideration of $10,299,900, in addition to royalties, an average of about $101 an acre. Also gas leases on 511,488 acres were sold for a bonus of $1,173,920.48.

On Osage lands at the close of the year there were 4,442 producing oil wells, 468 producing gas wells, and 124 wells being drilled. The year's gross production of oil was 12,138,086 barrels, of which the

Osage Tribe received 2,043,458 barrels. The total receipts for the year from oil and gas accruing to this tribe approximated $17,000,000.

In the Five Civilized Tribes, 717.594 acres were under leases for oil and gas. The year's total production of oil on restricted land was 10,180,862 barrels and the total revenue from oil and gas $4,073,985.22. During the year 495 wells were drilled, 307 producing oil and 57 producing gas.

Outside the Five Civilized Tribes in Oklahoma the Indians on the Kiowa Reservation received about $800,000 from oil and gas and those of the Otoe Reservation received $50,589.48 from like sources. Producing wells on the Pawnee and Ponca Reservation are also bringing a substantial income.

In the Seneca jurisdiction there has been a great development of lead and zinc mining, resulting in a mining center of about 50,000 population and a tenfold increase of agency business.

Under recent legislation metalliferous minerals on unallotted Indian lands in Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Washington, and Wyoming will be under exclusive control of the bureau.

Miscellaneous matters.—Forty per cent of reimbursable funds expended for individual Indians has been repaid. The balance is not delinquent, as it is payable in installments. The beneficiaries as a rule have been doing well and in many cases need no further assistance. Tribal herds established from such funds have been profitable, and these are a guaranty of payment. Eventually this stock will be placed among individual Indians.

The disbursement of individual Indian funds to both adults and minors is proceeding under more liberal principles in furtherance of the gradual emancipation of the Indians from Government control, and if an adult Indian is at all competent he is given unrestricted control of his funds. During the year over $10,000,000 of individual moneys were paid directly to the Indians or expended for their benefit.

One of the principal per capita payments of the year was the distribution of $200,000 among the Indians of the Uintah and Ouray jurisdiction in Utah, a portion of which was applied to special advantage in supplying irrigation to allotments and securing water rights to the Indians.

Indians in New York.—Unusual problems have arisen in connection with the affairs of some 5,000 Indians still in New York who own seven reservations, including over 80,000 acres. The State has for some time exercised extensive jurisdiction over these Indians, and there has been supervision by the Federal Government on various matters. Recent court decisions have tended to strengthen the view that the State is without power to deal with their tribal

property rights. A commission authorized by the New York Legislature to take up with Congress and the Federal departments the question of jurisdiction and administrative control of their affairs has not yet formulated its course of action, so that a more definite statement can not at present be made.

The Florida and Texas bands.—Encouraging progress is being made in behalf of the Seminoles of Florida. Their interests are being supervised by an experienced field-service man whose degree of Indian blood gives him fortunate access to the nature and needs of this band. An industrial center is being created for the purchase of small beginnings in live stock, awakening their interest in education and conserving their health.

An appropriation of $5,000 is being used in constructing a school building for the Alabama Indians in Texas, to be completed for the coming school year, which will accommodate all their children of school age.

Homeless Indians in California.—Two inspecting officers have been detailed under explicit instructions to make a thorough survey and study of the nonreservation Indians in California and their needs, concerning whom conflicting reports as to their health, poverty, and moral condition have been received. When completed this survey will afford an intelligent basis for action. Lands and homes for certain of these Indians were purchased during the year at an approximate expense of $16,000.

Papago land litigation.—There is pending at this time in the Supreme Court of the District of Columbia a case which is regarded as one brought to test the validity of 16 purported quit-claim deeds attempting to convey to one Robert F. Hunter, late of Washington, D. C., a one-half undivided interest in 16 tracts of land alleged to represent the "lands and grants" of certain Papago Indian villages located in Pima County, Ariz., and now embraced in the Papago Indian Reservation created by Executive order of February 1, 1917. The lands in which the interest is attempted to be conveyed aggregate approximately 2,600,000 acres.

In this suit are involved questions of title to practically all the land embraced within the limits of the present Papago Indian Reservation, and its successful prosecution is of vital interest to the Papagos of that country. For this reason a special supervisor of this office has for the past year been engaged in a thorough investigation of the entire situation and in assisting the Department of Justice.

PENSION OFFICE.

Number of pensioners.—There were on the roll at the end of the fiscal year 624,427 names, a net loss of 22,468 from the total of 646,895 on the roll at the beginning of the year.

The number of Civil War soldiers on the roll June 30, 1918, was 298,808, and on June 30, 1919, 271,391, showing a decrease of 27,417. The number of deaths of Civil War soldiers in 1919 was 27,703, as against 30,466 in 1918.

The number of Civil War widows on the roll June 30, 1918, was 288,815, and on June 30, 1919, 293,244, showing an increase of 4,429.

The deaths of widows, minor children, and dependents in 1919 numbered 19,217, as against 18,412 in 1918.

The highest number of Civil War soldiers on the roll was in 1898, when there were 745,822. The highest number of Civil War widows on the roll was in 1912, when there were 304,373.

Of the War of 1812, there were surviving on June 30, 1919, 81 widows.

Of the War with Mexico, there were on the roll June 30, 1919, 215 survivors and 2,739 widows.

Of the War with Spain, the total number of original claims allowed by the bureau is 41,335. The number on the roll June 30, 1919, by reason of the War with Spain, is 28,251.

Unexpended balances of appropriations.—The unexpended balances of appropriations at the end of the fiscal year were as follows:

For Army and Navy pensions	$947,170.97
For fees and expenses of examining surgeons	38,771.74
For salaries	118,419.86
For per diem and expenses of special examiners	None.

Disbursements for pensions.—The amount disbursed in the payment of pensions for the year was $222,159,292, as against $179,835,329 for the preceding year. The amount appropriated for the payment of pensions for the fiscal year 1919 was $223,000,000, as against $183,000,000 for the preceding year. A deficiency appropriation of $3,000,000 was made in addition to the original appropriation of $220,000,000 for the fiscal year. The larger amount was due because of increases given by new legislation.

The number of pensioners residing in foreign countries in 1919 was 3,747, and the amount paid to these pensioners was $1,188,188.

Certificates issued and applications filed.

Pension certificates issued on admitted claims during the fiscal year	54,984
Reissues in lieu of lost pension certificates (duplicates) during the year	1,335
Accrued pension orders issued during the year	20,103
Widow's increase orders, act of Sept. 8, 1916, issued during the year ending June 30, 1919	81
Total	76,503

There were received and classified in the Law Division during the year 61,756 applications of all kinds.

Division of pension.—Under the act of March 3, 1899, providing for division of pension of resident pensioners of the United States

who have deserted their wives or children or who are inmates of soldiers' or sailors' homes, 429 cases were acted upon.

Under the act of August 8, 1882, of all claims of widows and children of pensioners undergoing imprisonment or insane without a guardian, 26 cases were acted upon.

New legislation.—The act of July 16, 1918, provides pension to widows and minor children of officers and enlisted men who served in the War with Spain, the Philippine insurrection, or in China:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the passage of this act if any volunteer officer or enlisted man who served ninety days or more in the Army, Navy, or Marine Corps of the United States, during the War with Spain or the Philippine Insurrection, between April twenty-first, eighteen hundred and ninety-eight, and July fourth, nineteen hundred and two, inclusive, service to be computed from date of enlistment to date of discharge, or any officer or enlisted man of the Regular Establishment who rendered ninety days or more actual military or naval service in the United States Army, Navy, or Marine Corps in the War with Spain or the Philippine Insurrection between April twenty-first, eighteen hundred and ninety-eight, and July fourth, nineteen hundred and two, inclusive, or as a participant in the Chinese Boxer rebellion campaign between June sixteenth, nineteen hundred, and October first, nineteen hundred, and who has been honorably discharged therefrom, has died or shall hereafter die leaving a widow without means of support other than her daily labor, and an actual net income not exceeding $250 per year, or leaving a minor child or children under the age of sixteen years, such widow shall upon due proof of her husband's death, without proving his death to be the result of his Army or Navy service, be placed on the pension roll from the date of the filing of her application therefor under this act, at the rate of $12 per month during her widowhood, and shall also be paid $2 per month for each child of such officer or enlisted man under sixteen years of age, and in case of the death or remarriage of the widow, leaving a child or children of such officer or enlisted man under the age of sixteen years, such pension shall be paid such child or children until the age of sixteen. *Provided*, That in case a minor child is insane, idiotic, or otherwise permanently helpless, the pension shall continue during the life of said child, or during the period of such disability, and shall commence from the date of application therefor after the passage of this act: *Provided further*, That said widow shall have married said officer or enlisted man previous to the passage of this act: *Provided, however*, That this act shall not be so construed as to reduce any pension under any act, public or private.

Under this act pensions have already been granted to 992 widows, 72 minor children, and 1 helpless child.

Attention is called to the fact that a distinction was made between services of volunteer officers and enlisted men and those in the Regular Establishment as a prerequisite to the allowance of widows and minors pensions in said act. In the case of Anna, as widow of Oscar J. de Rochmont, decided by the Assistant Secretary of the Interior, January 31, 1919, it was held:

Volunteer officers and enlisted men mentioned in the act of July 16, 1918, refer to those who were members of volunteer organizations as distinguished from the Regular Establishment.

Their dependents are pensionable if such an officer or enlisted man served during the period of any of the wars mentioned in said act for 90 days or more and was honorably discharged, independent of the geographical locality of such service.

The dependents of an officer or enlisted man of the Regular Establishment are not pensionable under said act unless such officer or enlisted man rendered actual service. "Actual military service" mentioned in said act are words of limitation, and are descriptive of such duty in a war as is to be performed by one in the Army and Navy from being on the scene of conflict; that is to say, at the theater of operations on sea or land, of invasion of enemy territory, of repelling invasion by the enemy, and the like.

When the bill was pending before the House of Representatives, Mr. Keating of Colorado, in charge of the bill, made a preliminary statement, page 9672 of the Congressional Record of July 9, 1918:

This bill does not provide pension for the widow or the minor children of a soldier or sailor of the Regular Establishment unless he actually left the confines of the United States and participated actively in the War with Spain.

In the case of Rebecca, as widow of Jeremiah Cottrell, decided by the Assistant Secretary of the Interior, May 19, 1919, it was held:

Enlistments in the Navy under the naval appropriation act approved May 4, 1898, for the naval service for the fiscal year ending June 30, 1899, were enlistments in the Regular Naval Establishment, and such persons were not "volunteer officers or enlisted men" as are mentioned in the act of July 16, 1918. The claimant's husband was enlisted under the provisions of the act of May 4, 1898, was a member of the Regular Naval Establishment, and as his entire service was outside the zones of conflict in the War with Spain, Philippine insurrection, or Chinese Boxer rebellion campaign, his widow has no title to pension under the act of July 16, 1918.

Special acts of Congress.—During the year 28 omnibus bills to grant pensions by special acts of Congress were enacted into law. These acts granted pension or increase of pension to 3,442 individuals, among whom was the widow of ex-President Roosevelt.

Marriage and divorce.—Many claims require determination of the marital status of the parties. During the fiscal year 589 such cases required formal opinions by the Law Division for their determination. The fact that hardly any two States have the same laws concerning marriage and divorce complicates the situation. Complaint has been made with increasing volume because of the rigorous requirements of the law, and the practice in the Pension Bureau, as to proof of validity of the marriage relation. After living with the soldier as his wife for a long period, as his widow a claimant is often called upon to show the soldier's previous marital history for a period sometimes covering more than 40 years. Under existing laws the Pension Bureau has no power to change its practice in this respect, and as the hardship imposed upon worthy women increases with the lapse of time, it is thought that Congress should pass some legislation looking to relief. It might, for instance, declare that

cohabitation for a fixed period of time up to the date of the soldier's death should give rise to a conclusive presumption for pensionable purposes, that the wife thus cohabiting is the legal widow of the soldier to the exclusion of any other.

Lands for the loyal.—Secretary Lane's plan to furnish land and homes to our soldiers and sailors who fought in the world war is in keeping with the former policy of the Government. For service in wars prior to 1855 the Pension Bureau issued land warrants to 798,701 applicants, embracing 68,793,870 acres.

Monthly payment of pensions.—There seems to be a general demand among soldiers and soldiers' widows for the monthly payment of pensions. The need of payments at shorter periods than quarterly is patent to everybody. An estimate has recently been furnished the Committee on Invalid Pensions in the House of Representatives showing that for the current year an additional appropriation of $175,000 would cover the expense involved in the change. From February 1, 1913, when the system of paying pensions through a disbursing office in the bureau was established to take the place of the agency system, to June 30, 1919, there was paid out in pensions a total of $1,140,433,323.10 without a single item being disallowed by the officers of the Treasury for improper payment. At the beginning of the period the force employed in paying pensions numbered 275, the pensioners on the roll, 837,000; at its close, 163 and 624,427 respectively.

Pension Bureau work.—The Pension Bureau has by years of study, training, and experience built up an efficient system of handling pension claims. It has a highly skilled corps of examiners, who by training, study, long experience, and knowledge of the various pension laws and decisions, have become expert in determining the rights of claimants to pension. It also has a highly competent, technical, and experienced corps of medical examiners who pass upon all medical questions arising in a claim, and a field force whose duties are to investigate doubtful or difficult claims and those in which criminal features are involved. The bureau has equipment and electrical machinery for preparing and mailing millions of checks each year. This equipment and machinery is operated by highly skilled employees.

Should Congress provide for civil-service retirement, the monthly payment of pensions, and the transfer of the compensation feature of the Bureau of War Risk Insurance to the Bureau of Pensions, this bureau could easily assimilate and dispose of the additional work entailed at a minimum outlay for clerk hire and other necessary expenses.

Age of employees.—The following statement shows the number, ages, etc., of employees in the Pension Bureau on the 1st day of

July, 1919, considered especially with reference to civil-service retirement:

Number in classified civil service	874
Age of oldest employee	88
Number over 80 years of age	26
Number between 65 and 80 years of age	266
Based on age of 65, number eligible for retirement	292
Percentage of all employees eligible for retirenfent	33.4
Average age of all employees July 1, 1919	58

Metal boxes for the files.—In former reports statements have been made showing the superiority of metal boxes for the files over the leather strap heretofore used. The metal boxes cost about 64 cents as against 80 cents for a strap, and the life of a box is indefinite, whereas a strap only lasts a few years. A total of 23,500 boxes have been purchased, and it is estimated that 56,462 more boxes would be sufficient in which to place all the files.

PATENT OFFICE.

During the first half of the year, owing to war conditions, there was a noticeable falling off in the number of applications for patents filed. After January 1, 1919, however, a steady increase in the number of applications became noticeable, and at the end of the year the receipts were fully normal. During the year a total of 75,657 applications for patents, including reissues, designs, trade-marks, labels, and prints were filed. This was 2,350 more than were received during the preceding year ending June 30, 1918, and 5,882 less than for the year ending June 30, 1914, when the receipts reached the maximum number in the history of the office. During the year 8,354 applications were forfeited for failure to pay the final fee, but this number is less by 1,159 than that of the previous year. The total number of patents granted and trade-marks, prints, and labels registered was 43,353. This was 2,725 less than in the preceding year and 10,124 less than in the year 1916. The receipts of the office for the year were $2,113,350.17, being an increase of $9,689.61 over the preceding year.

BUREAU OF EDUCATION.

Statistics.—During the year a representative of the Bureau of Education has visited 12 States for the promotion of the bureau's plan to secure the cooperation of State departments in the adoption of a uniform system of compiling and reporting statistics. The plan is to give recognition to State departments as the center from which all educational reports come, and from which all authentic data concerning educational institutions, public and private, may be obtained. As a result of this plan:

1. Comparable statistics for all States will be secured and made available by the Bureau of Education.

2. Local school officers will be relieved of the duty of making numerous reports in different forms.

3. The State department of education will gain in prestige and recognition as the head of the entire educational system of the State.

Correspondence.—First-class mail matter received by the Bureau of Education during the year amounted to 227,958 pieces, an increase of 65,479 from the number received in 1918. These numbers include both the Washington and field offices.

Library.—The library continued to acquire new additions of publications as they were issued and also added material of earlier date. Among the most unique and comprehensive collections acquired is that of textbooks used in elementary and secondary schools of the Argentine Republic and Brazil. The library has secured nearly all of the new European books on education published by friendly nations during and since the war. In addition to educational bibliographies compiled and circulated, a series of leaflets were issued, monthly records of current educational publications, and the 1918–19 sections of the Educational Directory revised.

Publications.—During the year the bureau has had printed a greater number of documents than in any other similar period of its history. One million five hundred and five thousand four hundred and forty-eight of these were distributed by the mailing division, and, in addition, 1,396,518 mimeograph letters were sent out. Bulletins on all the important phases of education were published and distributed; leaflets on secondary and higher education, circulars, reading courses, and lessons were distributed. School Life, a bureau publication issued twice a month, has a circulation of 20,000. School Service, another bureau publication distributed semimonthly during the early part of the year with a circulation of 583,000, was discontinued on May 1.

Educational surveys.—A number of educational surveys were carried on during the year, among which are the following: A study of the educational system, elementary, secondary, and higher, in the State of Alabama; a study of consolidation in Mount Joy Township, Pa.; survey of Belle County, Tex.; survey of the following cities: Memphis, Tenn.; Columbia, S. C.; Passaic, N. J. All of these were made at the request of the school officials concerned with the administration of the schools surveyed.

Activities of the divisions of the bureau.—Besides engaging in the educational survey of Alabama, the Division of Higher Education passed upon the eligibility for accrediting by the United States Naval Academy of 473 institutions; prepared statistical reports con-

cerning higher institutions; represented the bureau at meetings and conferences on higher education; organized a series of conferences for the preparation of a course of study in agricultural education. The members of the division were intimately connected with the entertainment of the British Educational Mission and assisted in planning their itinerary to visit institutions in the United States.

Under the direction of the Rural Division, important conferences were held on rural education at Stevens Point, Wis., Daytona, Fla., and Oklahoma City, Okla. Conferences were attended by persons prominently identified with public affairs, and the bureau's program for rural school improvement was set forth. Members cooperated with States and institutions in several additional conferences and educational campaigns. The educational section of the Department of the Interior Exposition, held in the spring of 1919, was under the direction of this division.

Studies have been made as follows: Rural education in Nebraska; standardization of rural schools in the United States; the administration and supervision of village schools; principles of school legislation; status of rural teachers in Nebraska; certification of teachers in the United States; teachers' salaries; consolidation of schools in the United States. Members of the division participated in the educational survey of the State of Alabama, and made a survey of Mount Joy Township, Pa.

The Division in City School Administration participated in three educational surveys; prepared a bulletin on the phonic method of teaching reading; made studies on the causes of failure and non-promotion, and prepared and distributed circulars concerning educational legislation.

In the kindergarten section, leaflets were prepared on kindergarten promotion and assistance given in the campaign for kindergartens in Texas. This division also assisted the War Department in selecting equipment of kindergartens in the Government schools.

The specialists in industries and home making and agricultural and commercial education participated in conferences and prepared bulletins and circulars; assisted in several surveys and cooperated with other organizations—such as the Food Administration and the Young Men's Christian Association—in educational work.

The specialist in school hygiene and physical education cooperated with the Public Health Service and the Child Health Organization in the preparation of a health education series; assisted in surveys made by the bureau, and advised with county and State school boards concerning buildings. Studies were made on physical education in normal schools, janitor service in the city schools, and similar subjects.

The School Garden Army continued its work of organizing the school children of the country to cultivate gardens. Over 5,000,000 manuals and leaflets concerning garden instruction were distributed. Moving-picture films were shown to over 300,000 persons. At the end of the fiscal year, 1,813,352 children were enrolled in 2,125 cities of the United States. The total value of products for the year is estimated at $48,000,000.

The Division for School Board Service registered 20,000 high-grade teachers during the year and made 15,000 nominations to school boards.

A Division of Educational Extension was maintained in the bureau for six months with an allotment of $50,000 from the President's fund for national security and defense. Particular attention was given to Americanization work through the distribution of material concerning courses for teaching emigrants, books on the teaching of English, and the like.

By means of a cooperative agreement by the Secretary of the Interior and the American Nationalization Committee of New York, the regular work of the Bureau for Americanization was enlarged. One section was maintained in Washington and one in New York. As a result of the work done through this division, the importance of Americanization has been emphasized and the problem clarified; important laws have been enacted, Americanization societies organized, and the cooperation of a number of organizations and activities secured.

Alaska.—During the year the field force of the Bureau of Education in Alaska cooperated with the Public Health Service in an effort to furnish relief to the natives during the influenza epidemic. Nurses and doctors were sent from Washington State to cooperate with the bureau's physicians and nurses, all of whom were placed at the disposal of the governor and rendered zealous service in the native villages. People of the Territory and the Red Cross cooperated. The bureau continued the policy of encouraging the establishment of cooperative enterprises in native villages. By the congressional appropriation of $75,000, the medical work of the bureau among the natives of Alaska was continued during the year. Physicians and nurses were employed and several hospitals erected in which native girls are trained for nurses. The superintendent of education for Alaska has assumed charge of the work of taking the 1920 census for Alaska.

War work.—All of the divisions of the bureau continued to do a large amount of war work until the armistice was signed and after. They have cooperated with the War Industries Board in passing on applications for promotion to direct school buildings and issue bonds.

The commissioner submits a series of 29 recommendations for better work and greater usefulness on the part of the bureau. He urges that its staff be greatly increased and made more than proportionally effective by the addition of an assistant commissioner, a private secretary to the commissioner, an assistant editor, a specialist and assistants in foreign educational systems, two collectors and compilers of statistics, additional specialists in higher education, rural and industrial education, commercial education, school hygiene, city school administration, community organization, and a greatly increased staff of stenographers and clerks. He asks that the statutory salaries of several members of the present staff be increased, and that the limitations on the salaries paid from lump-sum appropriations be removed.

To the present organization of the bureau the commissioner would add the following listed divisions:

1. For the study of exceptional children, both subnormal and supernormal, and the best methods of educating them.
2. For scientific experiments in methods of education.
3. For the study and eradication of adult illiteracy.
4. For Americanization work among the foreign-born population of the United States.
5. For the study of and help in the home education of children.
6. For educational extension work.
7. For a school board service to assist school boards in securing high-grade teachers.
8. For the study and establishment of model rural schools.

He asks for the reestablishment of the Division of Negro Education and Backward Peoples with an annual appropriation of 25,000.

For medical and relief work in Alaska and for the education of the Alaskan natives he desires appropriations, respectively, of $125,000 and $300,000. To these Alaskan activities he would add the work of assisting the natives to develop and establish their own remunerative industries.

Finally, the commissioner points out the very great need of a Federal educational building in which may be housed the bureau and the Federal Board for Vocational Education.

GEOLOGICAL SURVEY.

Nature of the work of the year.—During the first half of the fiscal year practically all the energies of the Geological Survey were concentrated on war work. A census of the country's resources of manganese, chromite, tungsten, and quicksilver and of oil, gas, and coal was made, field work was done to discover new deposits, and maps and data showing the distribution of the mineral deposits in foreign countries, their quality and extent, the output of districts

and regions, and the trade distribution of minerals in the world's commerce were prepared. These maps proved so valuable to all the agencies that used them that it has been decided not only to make them public but to continue and keep up to date the compilation of like data for the benefit of American industry and commerce.

The work of the last half of the year has consisted largely of the completion of the field projects undertaken and the orderly summation and conservation of the military and economic results. Classified estimates of the country's mineral reserves have been completed and made available for future use in war or in peace, sampling of minerals and estimates of quantities available have been followed by contributions to our knowledge of the mode of origin of ores or minerals, and the special military inquiries as to underground water, road-building materials, rare minerals, and other subjects examined have led to broader views and better methods of work. Some of the war work—for example, the preparation of frequent reports showing the rate of production and transportation of coal—has been carried along, to the advantage of both the producer and the consumer.

The appropriations for the work of the survey for the fiscal year 1919 amounted to $1,437,745.50. The roll of members holding appointments from the Secretary at the end of the fiscal year numbered 967, a decrease of 33.

Geologic surveys.—The geologists of the survey were engaged during the year in finding, examining, and studying deposits of manganese, chromite, tungsten, zirconium, molybdenum, iron, salt, high-calcium lime, white clays, nitrates, potash, and sulphur, chiefly for the purpose of supplying military needs. A wall map showing the deposits of manganese ore in the United States classified as to types was prepared. Military maps of the country around several camps and training stations, with accompanying descriptions, were prepared and printed; data were gathered for the use of the staff of the Chief of Field Artillery in selecting sites for artillery ranges and cantonments; information was compiled on road-building material and on water supplies for the use of the Chief of Engineers in connection with the preparation of the progressive military map of the country, and information was compiled concerning the mineral deposits and production of other countries. Cooperation was arranged and put into effect with several States, universities, and councils of defense; special statements and summaries were prepared for the War Industries, Shipping, and War Trade Boards, and the information that was of greatest immediate need to the public was promptly published through newspapers and technical magazines. Since the armistice was signed illustrated reports on the economic geology of the many deposits studied have been in prepara-

tion or are already published, and data have been compiled for the information of the War Minerals Relief Commission.

Cooperation with the Fuel Administration was continued, and commercial data on coal were mapped and filed so as to be readily available for the use of the Fuel Administration and other branches of the Government. The consideration of questions relating to the pooling and zoning of coal led to the preparation of a detailed and comprehensive scheme of classification of coals.

The search for new reserves of petroleum to supply war demands was continued.

The most important cooperative investigations were made with the Bureau of Mines and the War and Navy Departments in the search for helium-rich natural gas; with the Capital Issues Committee of the Treasury Department in examinations and reports on applications for capitalization; and with the Bureau of Internal Revenue in the compilation of the records of production of oil and gas fields, the calculation of the rates of depletion, and the formulation of rules to govern the application of income-tax laws to the depletion of oil and gas field properties.

The geologists of the survey cooperated in military and commercial investigations with the Ordnance, Aviation, and other branches of the War and Navy Departments, with the War Trade Board, the War Industries Board, the Fuel Administration, the Food Administration, the Capital Issues Committee, the Bureau of Internal Revenue of the Treasury Department, the Tariff Commission, the Bureau of the Census, the Bureau of Standards, the State Department, the Shipping Board, the Railroad Administration, the Federal Trade Commission, the Department of Justice, the Forest Service, and the Office of the Supervising Architect of the Treasury. In scientific investigations they cooperated informally with the Smithsonian Institution, the Bureau of Lighthouses, the Bureau of Fisheries, the Coast and Geodetic Survey, and the research laboratories of the Smithsonian Institution. Investigations have been undertaken or planned at the request of the Governments of the Dominican Republic, Haiti, the Virgin Islands, and Porto Rico, and assistance has been given to the geological departments of a number of colleges and universities.

The special investigations made for the military departments and branches of the Government included search for material for smudges, for porous rocks to be used in making more buoyant concrete ships, and for underground water for many cantonments and military and naval training stations, examination of target ranges, determination of locations for military storage places, examination and estimate of resources of natural gas, and investigations of resources of nitrate and potash both at home and abroad.

The restriction by an allied country of the exportation to America of high-grade clays near the end of the war led to an investigation in the eastern part of the United States of deposits of high-grade clays that might be used in making paper or in the manufacture of porcelain or of articles used in electrical equipment. A report on the investigation has been written for publication.

Studies were made of the geology and paleontology of the Canal Zone under an agreement between the Panama Canal Commission, the Smithsonian Institution, and the Geological Survey.

Geologic work was done in Porto Rico and the Virgin Islands with special reference to the ground water supply.

Certain reported deposits of chromite in the Dominican Republic were examined to determine whether the deposits were available for the military use of the United States.

Cooperative work on deposits of chromite and manganese in Cuba was done, and arrangements were made to render assistance to the Cuban Government in petrographic and paleontologic work.

The laboratory work included about 1,500 analyses and assays, among them more than 100 tests of rocks for platinum, a metal much needed for military use. Special determinations of the potash content of certain rocks were made.

Surveys in Alaska.—As most of the topographers and several of the geologists of the survey who had been working in Alaska either entered the Army or were assigned to work to be done in connection with the prosecution of the war it was not possible to continue the survey's work in Alaska in the customary way. The work done consisted principally of investigations of deposits of chromite and tin, surveys and examinations in the region that is being developed by the Government railroads, measurements of stream flow, and the usual census of the mineral production of the Territory.

Ten parties were engaged during 1918 in Alaska surveys and investigations. Eight of the parties were engaged in geologic surveys, one in topographic surveys, and one in stream gauging. The areas covered by reconnoissance geologic surveys on a scale of 1:250,000 (4 miles to an inch) amount to 3,500 square miles. Much of the time of the geologists was devoted to the investigation of special problems relating to the occurrence of economic minerals, the results of which can not be expressed in terms of area. About 1,200 square miles was covered by reconnoissance topographic surveys on a scale of 1:250,000 (4 miles to an inch). In cooperation with the Forest Service, stream gauging was continued in southeastern Alaska. Of the parties whose work may be classified geographically, three parties worked in southeastern Alaska, three in the Cook Inlet-Susitna region, one in the Yukon Basin, and two in Seward Peninsula.

Field work for the season of 1919 was begun before the end of the fiscal year by three parties.

The survey's branch office at Anchorage was maintained throughout the year to provide closer cooperation between the Geological Survey and the operators of the Government coal mines in the Matanuska Valley, as well as to aid the mining industry in the region tributary to the Government railroad, to keep in touch with local developments in mining and prospecting, and to furnish whatever aid may be rendered by giving information, advice, and publications to all who are engaged in mining and prospecting.

Statistics of mineral production.—Work in mineral statistics was carried on mainly for military purposes during the first half of the fiscal year.

Weekly statistics of the production of copper, lead, zinc, and aluminum were collected and were furnished to the Government purchasing agencies, a system of monthly reports covering the raw mineral materials that were of chief use in the war was established, and diagrams and tables showing not only the supplies available but the estimated requirements were prepared by the Geological Survey in cooperation with the War Industries Board and the mineral specialists of the Shipping Board. By contributions of geologic and statistical information and by the judgments of its trained specialists the Geological Survey aided the Capital Issues Committee in directing capital into those fields where it would be of maximum usefulness during the war.

During the year the survey contributed reports on mercury, graphite, phosphate rock, manganese, antimony, tungsten, magnesite, emery, corundum, bauxite and aluminum, and platinum to a series of mimeographed pamphlets issued by the Interior Department under the direction of the Bureau of Mines, showing the political and commercial control of these commodities throughout the world. Specialists of the survey also prepared chapters on mineral commodities and on economic conditions in Japan and Sweden for reports compiled by the Bureau of Research of the War Trade Board.

A voluminous index of the information on mineral resources in the possession of several Government organizations was compiled and was published in mimeographed form through the cooperation of the Central Bureau of Planning and Statistics.

The cooperation between the survey and the Fuel Administration in the collection of statistics of the coal and coke industries, begun in 1917, was continued throughout the year. Most of the details of this information will be published by the Fuel Administration, but summaries of the more essential data will be incorporated in the survey's volumes on the mineral resources of the United States.

Topographic surveys.—The new area mapped during the year was 10,068 square miles, making the total area mapped in the United States at the end of the fiscal year 1,289,958 square miles, or 42.6 per cent of the country. In connection with these surveys, 4,206 linear miles of primary and precise levels were run and 1,420 permanent bench marks were established. Primary traverse lines, aggregating 4,217 miles, were run, in connection with which 611 permanent bench marks were set. Triangulation stations numbering 61 were occupied and 50 were permanently marked.

In addition to 82 topographic maps and 69 accompanying tracings showing military information, a large wall map of the world was prepared for the use of the Shipping Board.

Detachments of enlisted men of the Four hundred and seventy-second Engineers, who were detailed to the Geological Survey for training in topographic-map drafting, assisted in drafting military maps in the office of the survey or were assigned to similar duty in other offices. In all, about 100 men reported for instruction.

Water resources.—Investigations of stream flow were continued by means of more than 1,200 gaging stations maintained in 38 States and in Hawaii and Alaska, and investigations of ground water were made in 12 States. Many investigations of the present and probable future use of both surface and ground water were made in connection with the classification of public lands, with special reference to their use for power under permit or for agriculture under the enlarged-homestead, desert-land, or Carey acts.

Investigations made in cooperation with the United States Fuel Administration of problems relating to the operation of power plants, interconnection of transmission systems, and substitution of water power for fuel power led to improvement in service and conservation of fuel. Statistical studies of power resources and output were continued after the armistice was signed.

Many reports based on special field investigations and office studies were prepared and submitted to the War Department and to boards and bureaus engaged in the conduct of the war, the work including the compilation of information concerning water supplies from springs and wells in different parts of the country, as well as maps and descriptions of water supplies along the international border and the Atlantic coast. During the war information and advice were given to the War and Navy Departments in regard to water supplies at about 100 military and naval establishments in the United States, such as cantonments, forts, navy yards, aviation fields, powder factories, arsenals, and supply depots.

The manuscripts and maps for two reports on desert watering places were completed and work on other like reports was well ad-

vanced, this work being done under a comprehensive plan for mapping and marking the watering places in the arid region east of the Sierra Nevada and the Cascade Range and west of a line running from eastern Oregon through Salt Lake City and Santa Fe to the mouth of Pecos River.

Land classification.—Public lands aggregating 6,439 acres were classified as to their content of coal, 3,703 acres being classified as coal land and 2,736 acres as noncoal land. The coal land withdrawn from entry during the year amounted to 2,415 acres; the land restored to entry after classification and appraisal amounted to 3,331,552 acres.

The probable oil land withdrawn from entry amounted to 239,946 acres; the land restored to entry as nonoil land amounted to 931 acres. The result of the year's work was an increase of the area of oil reserves from 6,519,819 to 6,758,834 acres.

The net result of the withdrawals and restorations of oil-shale lands has been to reduce the oil-shale reserves 3,754 acres, leaving 128,267 acres reserved, practically all of it for the use of the Navy. In addition, 129,421 acres have been classified as to their content of oil shale, of which 4,080 acres were classified as nonmineral land and 125,341 acres were classified as lands valuable as a source of petroleum and nitrogen. A total area of 4,117,377 acres is now classified as oil-shale land and valuable for minerals, so that the grand total of oil-shale land now classified or withdrawn is 4,245,644 acres.

The area included in phosphate reserves remains the same as it was a year ago—2,724,394 acres.

The existing potash reserves were reduced by the restoration of 440 acres, leaving the area of outstanding reserves 130,029 acres.

The land withdrawn for power sites amounted to 7,392 acres, and the land restored amounted to 6,037 acres, the total area now so reserved aggregating 2,565,727 acres.

Lands amounting to 8,452,637 acres were designated as nonirrigable under the enlarged-homestead act, and designations of land amounting to 5,254 acres previously classed as nonirrigable were canceled on information that the lands are irrigable. The net increase in the area classified under these acts was 8,447,383 acres, and the total area so classified was 288,797,241 acres.

At the end of the year 20,181,868 acres had been designated as subject to entry under the stock-raising homestead law of December 29, 1916, as the result of field examination and office study. The number of applications pending under the law on June 30, 1918, was 34,649, and the applications received during the fiscal year 1919 amounted to 14,248, making a total of 48,897 in hand. Of this number 29,176 were disposed of during the year, leaving 19,721 cases on hand.

The area added to the public water reserves during the year amounted to 22,422 acres, and the area eliminated from such reserves amounted to 1,375 acres, a net increase from 204,634 to 225,681 acres.

The cooperation with the General Land Office, under which reports are submitted by the survey containing information as to the mineral value and water resources of lands for which applications under the public-land laws have been filed, was continued unchanged during the year. Similar cooperation exists with the Indian Office. In addition to 1,532 requests for information as to mineral character, power value, and value for public watering places pending June 30, 1918, 5,034 such requests were received during the fiscal year. Of these requests 4,259 were acted upon, leaving 2,307 awaiting action at the end of the year.

At the beginning of the year 295 requests for information as to mineral character only were pending, and during the year 1,665 such requests were received. Reports were made on 971 of these requests, leaving 989 pending at the end of the year.

During the year 151 requests for report as to water resources only were received, and 35 were pending at the beginning of the year. Reports were submitted on 151 requests, leaving 35 pending June 30, 1919.

The survey also furnished to the General Land Office reports upon the feasibility of irrigation projects and proposed power developments under the terms of the general plan between the two bureaus. Closely related to this cooperation is the duty of the survey to classify land under the enlarged and stock-raising homestead acts and to prepare appropriate orders for departmental approval designating lands under those acts.

Publications.—The Geological Survey's lithographic plant continued its war work for bureaus, boards, and offices of the War Department, the Navy Department, and other branches of the Government, the product including aviation maps and military maps of camps and other areas in the United States and abroad, charts, diagrams, and other work in editions aggregating several hundred thousand. Thirty new topographic war maps were photolithographed and printed and nine special maps showing Army camps and cantonments were compiled and printed with special texts on their backs.

Regular topographic maps of areas in the United States numbering 140 were engraved and printed. Editions of 360 different maps, amounting to 945,293 copies, were published.

Contract and miscellaneous work involving the printing of 2,935,543 copies was done, and the total number of copies of all work printed amounted to 3,884,849, an increase of nearly 20 per cent over the work done in the preceding fiscal year.

The regular series of the survey's publications printed at the Government Printing Office included 147 reports, aggregating 11,644 pages. During the year the survey distributed 465,826 books, 8,865 folios, and 538,396 maps.

RECLAMATION SERVICE.

It is now 17 years since the passage of the reclamation act, during which the surveys, examinations, and construction therein authorized have proceeded under the provisions of that act and other acts amendatory thereof and supplementary thereto. During the present year the service is in position to deliver water to about 1,600,000 acres of irrigable land, covered by crop census, of which about 1,120,000 acres are now being irrigated. Besides this storage water is delivered from permanent reservoirs under special contracts to about 950,000 acres more. The projects that have been undertaken have been planned to provide for an area of about 3,200,000 acres. This latter figure is tentative and subject to variation in accordance with the development of plans as the work progresses.

Drought conditions.—A large portion of the arid region has been subject to severe drought for the past two years, leading to heavy losses on the part of those attempting to cultivate the soil without irrigation and leading to shortage of water supply in many irrigated regions. The reclamation projects have been remarkably free from drought conditions, owing to the ample storage provisions usually made, the only notable exception being a small project in northern Washington where the drought conditions are so intense that shortage has been suffered on a few thousand acres of irrigated land. The general requirement for irrigation, together with the striking success of agriculture under the Government projects, has greatly stimulated demands for the extension and completion of existing projects and the construction of new ones.

Investigations of new projects.—Investigations have indicated the feasibility of many large projects in various parts of the West. Many of these, however, require far more work in surveys and estimates to make them available for construction, and liberal appropriations have been made by various States for this purpose, frequently on the condition that an equal amount of money be advanced for the same purpose by the General Government. The major portion of the investigation work now carried on by this service is expended under such contracts, the local contribution being made in some cases by the States and in others by voluntary associations.

Projects and extensons of projects investigated by the Reclamation Service in the Western States.

State and project.	Irrigable acreage.			Mean altitude.	Mean rainfall.	Probable cost.[1]	Readiness for construction.
	Public.	Private.	State.				
Arizona:				*Feet.*	*Inches.*		
Yuma Mesa	33,000	8,000	4,000	180	3	$7,500,000	Ready.
San Carlos	[2]40,000	30,000	.....	1,500	10	13,600,000	Not ready.
California:							
Imperial Valley	400,000	.....	.....	−200	3½	52,000,000	Ready.
Palo Verde	.....	40,000	.....	250	3	5,000,000	Not ready.
Turlock-Modesto	.....	260,000	.....	95	12	5,000,000	Do.
Kings River	.....	400,000	.....	225	10	12,000,000	Do.
Orland extension	.....	30,000	.....	245	18	2,500,000	Ready.
Iron Canyon	.....	250,000	.....	230	17	35,000,000	Not ready
Colorado:							
Grand Valley	15,000	15,000	.....	4,825	8	600,000	Ready.
Grand Valley drainage	.....	30,000	.....	4,650	8	1,200,000	Do.
Orchard Mesa	.....	9,700	.....	4,750	8	800,000	Do.
Uncompahgre	10,000	37,000	.....	5,500	9½	500,000	Do.
Montezuma	.....	42,000	8,000	5,900	12	3,500,000	Not ready
San Luis Valley drainage	.....	400,000	.....	7,600	7	10,000,000	Ready.
Idaho:							
Hillcrest	3,000	10,000	1,000	2,800	13	700,000	Do.
Black Canyon	3,000	35,000	1,000	2,400	12	2,000,000	Do.
Minidoka	95,500	250	6,750	4,300	12½	15,000,000	Not ready.
Hansen Butte	.....	22,000	.....	4,150	11	2,000,000	Ready.
Gem district	.....	27,000	.....	2,350	12	750,000	Do.
Lake Walcott	2,480	.....	20	4,400	12½	215,000	Do.
American Falls Reservoir	[3]33,000	33,000	.....	4,300	.....	12,000,000	Not ready.
Island Park Reservoir	[4]10,700	5,000	.....	6,250	15	4,000,000	Ready.
Boise Valley drainage	.....	30,000	.....	2,500	12½	600,000	Do.
Payette Valley drainage	.....	10,000	.....	2,250	11½	180,000	Do.
Montana:							
Milk River—Chinook division	.....	50,000	.....	.....	.....	.....	Not ready
Beaver Creek division	10,000	.....	708	2,200	14	1,700,000	Ready.
Cut Bank	[2]25,000	11,000	.....	3,800	13	1,200,000	Not ready.
Sun River	35,000	30,000	.....	4,100	11	4,000,000	Ready.
Bitter Root	.....	30,000	.....	3,450	11	1,500,000	Not ready.
Nebraska:							
North Platte extensions	65,000	88,000	10,000	4,100	13	9,000,000	Ready.
Dawson County	.....	45,000	.....	2,700	22	2,500,000	Not ready.
Farmers Canal	.....	50,000	.....	2,600	22	2,000,000	Do.
Nevada:							
Upper Carson	3,500	35,500	.....	4,800	12	2,000,000	Ready.
Pyramid Lake	15,000	1,000	.....	4,000	4	1,200,000	Do.
New Mexico:							
San Juan	[5]125,000	.....	.....	5,200	8	(6)	Not ready.
Middle Rio Grande drainage	.....	100,000	.....	4,800	7½	5,500,000	Ready.
Oregon:							
Klamath pumping units	.....	23,000	.....	4,100	12	1,200,000	Do.
Langell Valley	.....	17,000	.....	4,200	12½	1,000,000	Do.
Tule Lake	17,000	.....	.....	4,000	14	1,250,000	Do.
Rogue River	.....	30,000	.....	1,600	20	2,000,000	Not ready.
Greater Umatilla	3,500	12,000 [7] 3,050	.....	500	8½	3,100,000	Do.
Owyhee	6,000	17,000	.....	2,200	10	2,100,000	Do.
Deschutes	.....	200,000	.....	3,200	9	12,000,000	Do.
Lower Powder River	[8]38,000	25,000	.....	3,000	13	7,000,000	Do.
Horsefly Storage	2,000	1,400	.....	4,100	12½	300,000	Do.
South Dakota:							
Belle Fourche extension	11,000	22,300	3,917	2,800	14½	700,000	Do.
Texas:							
Tornilla-Fort Hancock unit	.....	27,000	.....	3,500	8	1,200,000	Do.
Utah:							
Castle Peak	70,000	.....	.....	5,200	9	7,000,000	Do.
Price River	30,000	.....	.....	5,500	12	(6)	Do.
Dixie	30,000	.....	.....	3,000	8½	(6)	Do.
Utah Valley drainage	.....	30,000	.....	4,500	18	1,000,000	Do.

[1] These estimates must be considered as merely preliminary and subject to change.
[2] Indian.
[3] In Fort Hall Indian Reservation.
[4] In Targhee National Forest.
[5] In Navajo Indian Reservation.
[6] No estimate.
[7] Railroad.
[8] 17,000 withdrawn under Carey Act

Projects and extensions of projects investigated by the Reclamation Service in the Western States—Continued.

State and project.	Irrigable acreage.			Mean altitude.	Mean rainfall.	Probable cost.[1]	Readiness for construction.
	Public.	Private.	State.				
Washington:				*Feet.*	*Inches.*		
Yakima High Line	13,600	130,000	6,000	1,000	7	$20,000,000	Not ready.
Kittitas	5,000	62,500	2,500	1,800	9½	8,500,000	Ready.
Wyoming:							
Riverton	31,000	40,000	13,000	5,100	19	6,000,000	Do.
Frannie extension	35,000	1,000	1,800	4,200	6	500,000	Do.
Heart Mountain unit	34,100	1,500	3,200	4,300	6	3,300,000	Not ready.
Willwood unit	14,700	320	600	4,300	6	900,000	Ready.
Oregon Basin	68,000			4,500	6	(2)	Not ready.

[1] These estimates must be considered as merely preliminary and subject to change.
[2] No estimate.

Irrigable and irrigated acreage.—The statistics of irrigation show that on the projects of the Reclamation Service there are about 500,000 acres of land to which the service is ready to deliver water but which are not irrigated. This immediately raises the query as to why this is so and suggests that further development be delayed. As a matter of fact, such a conclusion would be entirely unwarranted.

The most important item in the acreage not irrigated consists of the unirrigated portions of farms that are occupied and cultivated but have not been wholly brought under cultivation. The reduction of the average farm in the arid region to actual cultivation by the occupier requires clearing, leveling, and ditching, and is a slow process with the average settler, who has limited capital and is probably depending upon his own efforts and his own teams to accomplish results. The facts are that on the average three-fourths of each occupied farm is actually under irrigation, and this is a very good showing under the circumstances. Many old-settled communities have done little better.

The next item of importance is the acreage represented by holdings of nonresidents or of persons owning more than 160 acres and who are unable to purchase water right for the excess holding. The law prohibits the sale of water rights to nonresidents and to holdings greater than 160 acres. Gradually the excess holdings are being disposed of to new settlers, and the nonresidents are either selling to settlers or are themselves gradually occupying the lands and placing them under cultivation.

A third class is composed of the public lands that are open to entry and have not been filed upon. These are comparatively few, are distributed on several of the public-land projects, and are as a rule lands but recently opened to settlement or are of inferior quality, so that while they may be eventually taken this is not done until after the better opportunities are exhausted. Roughly speaking, the area

covered by crop census to which we can deliver water may be divided about as follows:

	Acres.	Per cent.
Occupied farms partly cultivated	1,312,000	8
Nonresident and excess holdings	240,000	15
Unentered public lands	48,000	3

Advantages of irrigation farming.—Agriculture in the arid region where irrigation is feasible has several important advantages over that in the humid region. The soils of the arid region by the nature of the case have generally not been leached of their mineral plant foods as have those in the humid region, and they are therefore much richer in this respect on the average and are seldom or never acid, as are soils in the humid region. This quality has the disadvantage at times of leaving the arid lands charged with hurtful alkalis, which seldom remain in the humid region on account of their solubility, but where the injurious salts do not predominate the general principle of abundance of mineral plant food obtains and constitutes a distinct advantage for the soils of the arid region over those of humid regions.

There is much advantage in being able to apply water to growing crops at just the time and in just the quantity needed, and to withhold it at will. Where the water supply is ample this constitutes a very important advantage in arid regions.

Another striking advantage is the preponderance of clear days in an arid region, where the absence of rainy and cloudy weather affords a much larger percentage of sunshine than is found in humid regions. As sunlight is one of the most important essentials of healthy plant growth, this advantage is quite important.

Results from these advantages.—It appears that the average gross product of agricultural crops on reclamation projects is just about double the average yield from nonirrigated lands in the country at large. The larger product obtainable per acre from irrigated lands jutifies and permits a more careful and intensive cultivation, which with a favorable climate and controllable water supply, yields more certain results than the same care in the humid region.

This means that as much product can be obtained from a 40-acre tract under irrigation as from the average 80-acre tract in the humid region. This, of course, requires more labor per acre, but much less labor in proportion to product. It permits and encourages intensive cultivation and smaller holdings and consequent greater centralization of population. The result is that the isolation of country life is to a large extent eliminated as the irrigating farmer will have fully

twice as many neighbors within a given radius as his prototype in the humid region. The social advantages thus obtained react upon the character of the people and of the communities and other conditions characteristic of irrigated regions to a similar effect.

Cooperation with his neighbors is forced upon the irrigator because it is usually impracticable for him to irrigate his land without such cooperation, the feasible irrigation projects usually being in tracts of many thousands of acres, accommodating thousands of families and giving rise to towns, villages, and characteristic civilizations of their own. This condition stimulates the civic conscience and attention to public affairs of common interest so that the local governments that grow up under such conditions are usually of a superior order and controlled by a superior intelligence on the part of the population living thereunder.

Irrigation progress.—During the past year the operations of the Government under the various reclamation laws have continued to develop the resources of the projects undertaken as shown by the gradual increase in the area for which the service can supply water, the increase in areas actually irrigated and cropped, and the increase in the value of crop produced. This progressive increase is shown in the following table, which gives statistics only for those areas covered by crop census, excluding practically all those additional areas which are served from the works of the Reclamation Service under Warren Act contracts and from which crop statistics were not obtainable. It is estimated that, including these areas, the crop value in 1918 amounted to $100,000,000 or over.

Year.	Irrigable acreage.	Irrigated acreage.	Cropped acreage.	Crop value.
1913	1,181,362	694,142	637,227	$15,676,411
1914	1,240,875	761,271	703,424	16,475,517
1915	1,330,222	814,906	757,613	18,164,452
1916	1,405,452	922,821	858,291	32,815,972
1917	1,502,468	1,026,693	966,784	56,462,313
1918	1,601,934	1,119,566	1,051,193	66,821,396

The statistics given in the above table do not, however, tell the whole story. The easy terms of repayment granted by the Government and the high prices received for their products have combined with the other favorable conditions and with the industry of the people to produce a condition of prosperity beyond the indications of the bare statistics.

Contracts under Warren Act.

[Act of Feb. 21, 1911, 36 Stat., 925.]

Name of contractor.	Date of contract.	Area in acres.	Amount of water in acre-feet.
BOISE PROJECT, IDAHO.			
Boise, Payette Lumber Co	June 15, 1918	100.16	250
Farmers' Cooperative Ditch Co	Dec. 3, 1917	15,500	1,000
Farmers' Union Ditch Co	Aug. 13, 1917	8,100	2,425
Black Canyon Irrigation District	Jan. 2, 1918	39,000	(1)
Nampa & Meridian Irrigation District	June 1, 1915	24,557	2,934
New York Canal Co. (Ltd.)	July 1, 1918	21,498	(2)
Pioneer Irrigation District	Feb. 27, 1913	34,400	17,700
Pioneer Irrigation District and Black Canyon Irrigation District	May 28, 1919	6,000	43,000
Riverside Irrigation District and Big Bend Irrigation District	Feb. 15, 1918	14,385	1,000
Settlers' Irrigation District	Feb. 9, 1918	12,000	1,500
Do	Feb. 18, 1919	420	(1)
Total		175,960.16	
MINIDOKA PROJECT, IDAHO—JACKSON LAKE ENLARGEMENT UNIT.			
Aberdeen-Springfield Canal Co	June 4, 1917	65,000	40,000
American Falls Canal Securities Co	Dec. 28, 1917	7,000	2,685
Armsberger, J. R	June 1, 1918		300
Bradbury, W. A., and J. C. McMullen	Apr. 23, 1917	280	209
Burgess Canal & Irrigating Co	Mar. 28, 1917	23,000	5,120
Conant Creek Canal Co. (Ltd.)	Aug. 5, 1918		240
Dewey Canal Co	Aug. 4, 1918		240
Enterprise Canal Co. (Ltd.)	Apr. 15, 1917	7,000	6,100
Enterprise Irrigation District	Aug. 2, 1918		2,400
Farmers' Friend Canal Co. (Ltd.)	Aug. 5, 1918		800
Farmers' Friend Irrigation Co	June 18, 1917	10,000	2,000
Farmers' Own Ditch Co. (Ltd.)	Aug. 2, 1918		240
Harrison Canal & Irrigation Co	Apr. 5, 1917	13,000	5,000
Independent Canal Co. (Ltd.)	Aug. 3, 1918		2,400
Kuhn Irrigation & Canal Co. and Twin Falls Canal Co	Feb. 25, 1913	410,000	400,000
Last Chance Canal Co. (Ltd.)	Aug. 4, 1918		480
Lenroot Canal Co. (Ltd.)	July 27, 1917	4,000	3,000
Lowder Slough Canal Co. (Ltd.)	Apr. 15, 1917	1,300	1,040
Lyle, W. S	do	160	155
Martin Canal Co	do	1,500	1,500
New Sweden Irrigation District	June 29, 1917	27,000	5,000
Poplar Irrigation District	May 1, 1917	1,200	1,200
Peoples' Canal & Irrigation Co	Apr. 15, 1917	20,000	8,000
Rudy Irrigation Canal Co	do	8,000	2,000
Snake River Valley Irrigation District	Aug. 11, 1917	24,000	15,000
Sunnydell Irrigation District	June 8, 1917	4,400	4,000
Total		626,840	
NORTH PLATTE PROJECT, NEBRASKA-WYOMING.			
Beerline Irrigation Canal Co	July 3, 1918	1,113	1,639
Browns Creek Irrigation District	July 14, 1913	7,784	19,900
Central Irrigation District	Mar. 6, 1913	1,501	4,050
Chimney Rock Irrigation District	do	3,916	10,300
Gering Irrigation District	Jan. 17, 1913	14,243	35,500
Tri-State Land Co. (Farmers' Irrigation District)	Aug. 20, 1912	60,000	180,000
Bridgeport Irrigation District	June 14, 1915	17,434	37,478
Goshen Land Co. (and Lingle Water Users' Association)	July 1, 1915	9,800	32,853
Pleasant Valley Lateral Association	June 16, 1915	4,000	13,522
Lincoln Land Co	Apr. 17, 1917	954	1,941
Dawson County Irrigation Co.[3]	Mar. 19, 1919		5,000
Total		120,745	
BELLE FOURCHE PROJECT, SOUTH DAKOTA.			
Beyer Aune and Bessie Hull Aune	May 2, 1918	36.8	
STRAWBERRY VALLEY PROJECT, UTAH.			
P. E. Whiting	June 8, 1916	40	40
John I. Hayes	do	26	20

[1] Canal capacity $\frac{5}{8}$ inch per acre. [2] Indeterminate. [3] Temporary contract for season of 1919 only.

Contracts under Warren Act—Continued.

Name of contractor.	Date of contract.	Area in acres.	Amount of water in acre-feet.
STRAWBERRY VALLEY PROJECT, UTAH—continued.			
William A. Pace	Sept. 26, 1916	120	50
Soldier Fork Unit	Dec. 15, 1916	130	67.5
Do	July 16, 1918	55	55
Clinton Unit	June 1, 1915	1,458.41	700.9
Payson City	Jan. 8, 1917	(1)	200
Spanish Fork City, No. 1655	Apr. 28, 1917	(1)	400
Spanish Fork City, No. 1710	Aug. 21, 1918	(1)	40
Springville Irrigation District	Dec. 29, 1917	3,000	2,400
Mapleton Irrigation District	Jan. 2, 1918	4,000	3,600
Do	Apr. 5, 1919	1,000	1,108
Total		9,823.41	
YAKIMA PROJECT, WASHINGTON.			
Sunnyside Irrigation District	Oct. 6, 1914	4,630	18,520
Snipes Mountain Irrigation District	Nov. 16, 1914	1,915	5,266.25
Outlook Irrigation District	Nov. 23, 1914	4,225	2,928.50
Union Gap Irrigation District	Mar. 2, 1915	1,500	4,275
Grandview Irrigation District	Aug. 4, 1916	3,994	10,983.50
Prosser Irrigation District	Dec. 1, 1917	2,150	6,450
W. O. Bradbury	May 22, 1916	18	54
Taylor & Robar	Nov. 24, 1916	30	90
Herbert Bostock	July 19, 1917	30	90
C. S. Mead	May 23, 1918	50	76
H. L. Stonebraker	Nov. 22, 1918	40	120
Total		18,582	
Grand total		951,987.37	

[1] City lots.

No new projects undertaken.—No new projects have been undertaken within the past year, as there have been no funds available for this purpose. The gradual decline in the receipts from the sales of public lands, due largely to the wholesale disposal of these lands under the operation of the 640-acre homestead act, has naturally greatly restricted the operations under the reclamation act. The small payments provided by law from the irrigated lands have kept the returns from the constructed projects to a low point. It is now necessary, under the provisions of existing law, to set aside $1,000,000 per annum from these receipts to repay the advances to the reclamation fund which were provided by the act of 1910, known as the "bond loan." It has been possible on this account only slightly to extend the irrigated area by some extension of canal systems and to take care of water-logged conditions on some of the projects.

Seepage and drainage.—The industry of irrigation by which water is applied to the surface of the soil for the growing of crops is necessarily attended by a considerable escape of such water to the subsoil, where in most cases it joins ground water, and this gradually rises. Such a condition is of course aggravated and expedited by wasteful applications of water, and this is very difficult to avoid if the soils are open and porous, but even in case of

tight soils and a reasonably economical use of water some rise of ground water is likely to occur, and very few irrigated regions of magnitude exist in the world which have not attached to them an important drainage problem. Accordingly, during the last few years one of the largest and most important activities of the Reclamation Service has been the provision of suitable drainage works on the various projects where these are required. In some cases these have been practically completed and are serving their purpose well, but in the majority of cases they are still in progress, and the available construction funds are not sufficient to carry this on with the requisite speed and economy. Hence considerable areas which ought to be returning construction charges are held back for this reason, as it is of course impossible to collect the charges from unproductive land.

Reclamation project operations.—The Salt River project in Arizona is being operated by the local organization of water users under a contract by which the Secretary of the Interior turned over the works and the income of the large power plants constructed in connection with the project. It is in a prosperous condition and the income from power a good deal more than pays the construction charges. The Government connection with this project is confined to occasional inspection and supervision, as provided in the contract. The ground water is rising on this project and will require early attention in order to prevent injury to a considerable area of land. This has been investigated by the water users' association, which is alive to the problem and will doubtless take necessary action.

On the Yuma project, Arizona-California, the Yuma Valley, which lies in Arizona, has been placed under public notice, but the payments are being contested by the water users' association. This contest came to trial in the month of April and the case is now held under advisement by the court. The Yuma Valley is exceedingly prosperous, having, with one exception, the highest gross yield per acre of any of the projects of the Reclamation Service. This for the year 1918 was over $113 per acre, exclusive of live-stock increase. Announcement has been made of the sale of a portion of the lands on the Yuma Mesa, which will be irrigated with water pumped from the main canal south of the city of Yuma under the provisions of a special act of Congress. A contract has been executed with the Imperial irrigation district to connect its system with Laguna Dam and provide better security for its water supply.

The Orland project in California is regarded as the first unit of a comprehensive project for the development of the Sacramento Valley. It, however, stands as a self-supporting project, with an ample water supply from Stony Creek, a tributary of Sacramento

River, and has been practically completed. Public notice on this project was issued in 1916 and all payments are made promptly when they fall due by the association as a whole. Thus all the annoyance, expense, and risk of delinquency are voluntarily shouldered by the water users' association, which has shown a commendable spirit of cooperation from the first. The project is prosperous and constantly growing in development. The only construction work in progress is a small amount of permanent canal lining, which was provided for in the current public notice, and which is necessary for checking the seepage from the canals constructed in coarse material.

The Grand Valley project in Colorado is delivering water to a portion of the land which has been opened to entry and occupied by settlers. The agricultural operations are gradually extending and results are encouraging. The physical conditions in this valley are difficult on account of the seamy shale which occurs on the canal system and which has required a large amount of maintenance and betterment work to render the canals tight. Aside from these difficulties, the works are operating in a very satisfactory manner.

The Uncompahgre project, Colorado, is being operated by the United States under contract with the Water Users' Association upon the payment of the cost of such operation by the association. The contract provides that the operation may be turned over to the Water Users' Association whenever they so elect, and this is being consummated. The existing contract provides for the operation and cost for a period of five years, at the end of which period the project is to be opened under public notice unless further extension is made by the Secretary of the Interior. At that time, according to the contract, the construction repayments will begin. The construction of the project is completed, so far as the plans of the Government have been made, but the distribution systems, which remain in the hands of the irrigators, are very unsatisfactory and should be enlarged and improved. The cultivation of the lands is gradually extending and slow improvement is being made in the use of water which is very wastefully applied to the lands. Efforts are being made to introduce the rotation system and to charge for water on an acre-foot basis, which will be necessary before good practice in the economy of water can be hoped for. The excessive application of water is manifested by a rising water table and the destruction of the fertility of some of the land. Agriculture in general is successful, and the settlers are prosperous.

The Boise project in Idaho includes the Arrowrock and Deer Flat Reservoirs, which have been completed, and a canal system which now delivers water to the main body of the project. Contemplated extensions will be made gradually to conform to better practices regarding the use of water which is sufficient for irrigating about

40,000 additional acres of land if used with reasonable economy. Public notice was issued in 1917 announcing the charges on the completed portion of the project, but the water users brought suit to escape a portion of the repayment, and this has been tried in the United States court. A preliminary opinion has been handed down by the court which holds that the full cost of the project must be paid by the beneficiaries but withholds decision upon several points of detail.

In addition to the main project, the United States, under 11 special contracts, delivers storage water to about 150,000 acres of lands that are served by independent systems. The current year has been one of exceptional drought, and it was preceded also by a very dry year. It is the general opinion, as expressed by the water users and the local press, that the benefits of the past season from the storage works constructed by the Government have been greater than the total cost of those works in the increased product upon the lands served by stored water, which would have been without water except for these works. The project as a whole is very productive and successful.

The Minidoka project in Idaho as originally planned has been completed, but several extensions are possible and desirable. The project is in two portions: That which is served with irrigation water by gravity has been formed into an irrigation district which operates the canal system serving it under contract with the United States; the pumping unit on the south side of the river is operated by the United States. The results of irrigation in this region are very striking and exceptionally successful.

The Huntley project in Montana is practically completed, and is one of the most successful and thickly settled projects of the service. Drainage work is in progress, and some enlargement of a portion of the delivery system is also being made. Construction payments upon the lands served are being regularly made.

In the Milk River Valley, Mont., water is being delivered through a canal leading from St. Mary River, which diverts that river just below St. Mary Lake. By a treaty arrangement with Canada the waters of the St. Mary are divided on an agreed basis and this water is being used very completely the present year. The demand for irrigation water, on account of the excessive dryness, is greater than ever before. The water is all used on a rental basis, partly through the works of the service and partly delivered to canal systems of private or cooperative companies.

On the Sun River project, Montana, the original unit on the south side of Sun River is being operated as usual. On the north side of the river where many of the settlers were attempting to secure title to their homesteads without the liability for irrigation water, which

is included in their filing papers, a series of three dry years in succession has shown that dry farming is not profitable and has revived the demand for irrigation water. Difficulties with the canal systems have been encountered on account of the unfavorable material with which they were constructed, but it is possible this year to deliver water to about 25,000 acres, and a considerable portion of this is being served on a rental basis. A beet-sugar factory would be profitable in this region.

The Lower Yellowstone project in Montana and North Dakota has been operated for years on a rental basis with only a small fraction of the lands irrigated. The neighboring lands have been for years farmed without irrigation, and though the returns from dry farming have always been less than under irrigation, the temptation to avoid the expense of water service has been so great that the project has not yet been placed on a paying basis. A series of dry years, however, has increased the demand for water and steps have been taken to form an irrigation district and arrange for permanent water rights for the lands to be included. Appropriate laws have been passed by both States, and the prospect is good for the success of the project. The demand for water on this project has been more than twice as great this year as in any previous year, and good crops are reported. The project offers favorable conditions for the location of a beet-sugar factory.

The North Platte project in Nebraska and Wyoming is one of the largest as well as one of the most successful of the reclamation projects. The Interstate unit on the north side of the river, most of which is under public notice, is largely under cultivation, and improvement is steadily extending. Drainage is being constructed, and considerable areas are yet to be relieved. On the south side of the river the main or Fort Laramie Canal and its lateral system are under construction, and water is being delivered under rental contracts. This is the region of most rapid development of anything in the service.

The Newlands (formerly the Truckee-Carson) project in Nevada is held back for two reasons. A drainage system is needed, and though some preparations have been made toward organizing a district to secure payment for this work, the State laws are not favorable, and this has not yet been successful. The other handicap is the lack of storage for the lands on the upper part of the system, but legal and other obstacles have been thrown in the way of a proper regulation of Lake Tahoe, the only available reservoir site of consequence which can serve this region. The main canals for using water have been built, but storage works are still necessary. Pending their development no further extension is feasible.

The Carlsbad project in New Mexico is gradually increasing its cultivated area, and is in a prosperous condition. Some drainage is still to be accomplished, but the water supply is ample, and results are satisfactory.

The Rio Grande project in New Mexico and Texas is being operated on a rental basis. Nearly one-half of the land is in cultivation, and is being served by storage water from the Elephant Butte Reservoir. The flat topography of the valley, the peculiar fineness of the soil, and the very wasteful use of water in the past have brought up the water table over most of the valley, and much of the land has been injured. An extensive drainage system is being installed, and is successful so far as constructed. Its prosecution, however, is greatly hampered by the lack of sufficient funds. The lateral system which has been operated for many years by the local association of irrigators is very inadequate and inefficient, and the water is wastefully used. At the instance of the water users the various works are being gradually turned over to the Government, and are being rebuilt and put in shape for efficient service. This will to some extent remedy the threatening condition of the rising water table, and is necessary for the success of the drainage system planned. The progress along this line has been successful so far, but not very extensive.

The North Dakota pumping project, which has not been operated for several years owing to failure of the lands benefited to make payment therefor, has been formed into an irrigation district and a contract made with the Secretary of the Interior assuring its operation and the payment for the cost thereof. It is being operated this year and good results are expected.

The Umatilla project in Oregon has always been bothered by drifting sand, and in some restricted localities by an extremely coarse subsoil which allows the rapid escape of irrigation water and the leaching of soil. These difficulties are being overcome to some extent and progress in cultivation is steady and encouraging. Urgent requests have been made for the Government to enlarge the project by taking over some of the private canals which have insufficient water supply and constructing a reservoir to serve them. This can not be undertaken without additional funds.

The Klamath project in Oregon and California is being gradually extended as the waters of Tule Lake recede owing to the diversion of the supply through the Government works. Drainage works are in progress and have been successful so far as constructed. Legislation is pending to permit the reclamation of the lands around lower Tule Lake, but has not yet passed. The project can not be successfully developed without this additional legislation. The irrigated land, however, is productive and the settlers generally prosperous.

The Belle Fourche project in South Dakota is growing in production and prosperity. It is a favorable location for a beet-sugar factory. In some localities the water table is rising and drainage works should be installed, but arrangements have not yet been made for the repayment of the cost. A small amount of the land under the feed canal and not served from the Owl Creek Reservoir suffers from water shortage in some years, and plans are under way for providing a small storage reservoir to serve these lands.

On the Strawberry Valley project in Utah the principal work constructed by the Government is a storage reservoir in Strawberry Valley on the head waters of the Duchesne River and the diversion of its waters through a long tunnel to the westward slope of the Wasatch range where the water is diverted from the Spanish Fork River and an irrigation system constructed. This system is being operated by the irrigators under special contract and payments of construction charges are being regularly made. In many instances canal systems already in existence are being operated by associations which have made arrangements for storage water from the Strawberry Valley Reservoir and are operating their own canal systems. There are still some water rights in the Strawberry Reservoir for sale.

Three extremely dry years—1917, 1918, and 1919—throughout a large portion of the West have broken all records for drought, and thousands of live stock and many private irrigation projects have suffered for lack of water. Dry farming has generally been a failure throughout these regions.

The Reclamation Service experienced serious water shortage on one project—the Okanogan project in northern Washington in 1918, and while there was some shortage also in 1919 it was not so great. Pumping plants were installed at Salmon Lake and Duck Lake to supplement the storage reservoirs which did not entirely fill. The additional pumping capacity and the enlargement of the reservoir hold-over capacity are the remedies being carried out.

The Yakima project in Washington includes a large system of storage reservoirs and two canal systems known as the Sunnyside unit and the Tieton unit. The project as a whole is very productive and prosperous and strong pressure is being made to secure the construction of more storage, the extension of existing canal systems, and the construction of new canals from the Yakima River and its tributaries. The excellent results obtained show that this would be a wise development. The Yakima project as a whole is one of the foremost in general prosperity and in returning the cost of this construction.

The Shoshone project in Wyoming is being gradually extended by additions to the canal and lateral systems on the north side of the

Shoshone River. The drainage system, which has been largely completed and has been very successful, is also being extended under contract with the water users in accordance with law. The lands are very productive and the project very prosperous. Preparations are being made for the construction of an additional unit on the south side of the Shoshone River for which ample storage capacity has been provided in the Shoshone Reservoir.

The value of the agricultural products exclusive of live stock produced by the Government reclamation projects during the season of 1918, amounting to nearly $67,000,000, has been over half of the net cost of construction of all of the projects during the last 17 years. On some of the projects the 1918 production has exceeded the total construction cost, and even better results are anticipated for the current agricultural year. The results in the extension of agriculture and of home making have justified the expectations of the advocates of this activity and argue strongly for its extension, for which there is great and growing demand.

Summary of construction results.—The following table gives a concise view of the work accomplished during the fiscal year and to date:

Summary of construction results, June 30, 1919.

Items.	To June 30, 1919.	To June 30, 1918.	Increase.
Lands:			
Estimated area of projects on completion	*Acres.* 3,212,008 / *Farms.* 67,447	*Acres.* 3,081,480 / *Farms.* 62,477	*Acres.* 130,528 / *Farms.* 4,970
Reservoir capacity available (original)	*Acre-feet.* 9,430,910	*Acre-feet.* 9,197,460	*Acre-feet.* 233,450
Canals, ditches, and drains:			
Canals over 800 second-feet capacity	*Miles.* 438	*Miles.* 420	*Miles.* 18
Canals 301 to 800 second-feet capacity	670	667	3
Canals 50 to 300 second-feet capacity	1,919	1,807	112
Canals less than 50 second-feet capacity	7,807	7,544	263
Total canals	10,834	10,438	396
Waste-water ditches	665	495	170
Drains, open	643	643	
Drains, closed	172	163	9
Total	1,480	1,301	179
Grand total	12,314	11,739	575
	Number. / *Length (ft.)*	*Number.* / *Length (ft.)*	*Number.* / *Length (ft.)*
Tunnels	95 / 143,847	94 / 142,237	1 / 1,610
Storage and diversion dams:	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*
Masonry	2,087,991	2,084,187	3,804
Earth	10,220,671	9,998,351	222,320
Rockfill and crib	1,203,386	1,185,529	17,857
Total	13,512,048	13,268,067	243,981
	Length (ft.) / *Cu. yds.*	*Length (ft.)* / *Cu. yds.*	*Length (ft.)* / *Cu. yds.*
Dikes and levees	513,989 / 4,517,664	504,426 / 4,470,702	9,563 / 46,962

Summary of construction results, June 30, 1919—Continued.

Items.	To June 30, 1919.		To June 30, 1918.		Increase.	
Canal structures:	*Concrete.*	*Wood.*	*Concrete.*	*Wood.*	*Concrete.*	*Wood.*
Costing over $2,000	1,044	201	958	184	86	17
Costing $500 to $2,000	2,100	528	2,011	478	89	50
Costing $100 to $500	9,896	5,870	9,177	5,011	719	859
Costing less than $100	19,682	57,824	16,386	55,003	3,296	2,821
Total	32,722	64,423	28,532	60,676	4,190	3,747
Grand total	97,145		89,208		7,937	
Bridges:	*Number.*	*Length (ft.)*	*Number.*	*Length (ft.)*	*Number.*	*Length (ft.)*
Steel	106	8,579	105	8,466	1	113
Combination	414	12,542	414	12,542	...	...
Wood	6,134	135,218	5,500	117,606	634	17,612
Concrete	346	4,399	342	4,254	4	145
Total	7,000	160,738	6,361	142,868	639	17,870
Culverts:						
Concrete	1,930	95,088	1,832	88,719	98	6,369
Metal	1,560	54,929	1,433	52,005	127	2,924
Terra cotta	1,505	64,096	1,096	50,947	409	13,149
Wood	4,049	96,492	3,164	72,213	885	24,279
Total	9,044	310,605	7,525	263,884	1,519	46,721
Pipe:	*Linear feet.*		*Linear feet.*		*Linear feet.*	
Concrete	628,572		596,250		32,322	
Metal	247,136		239,616		7,520	
Terra cotta (tile)	1,270,375		1,166,337		104,038	
Wood	495,432		471,236		24,196	
Total	2,641,515		2,473,439		168,076	
Flumes:	*Number.*	*Length (feet).*	*Number.*	*Length (feet).*	*Number.*	*Length (feet).*
Concrete	85	27,658	80	20,427	5	7,231
Metal	960	159,072	755	150,799	205	8,273
Wood	2,141	449,569	1,928	433,947	213	15,622
Total	3,186	636,299	2,763	605,173	423	31,126
Canals lined:	*Concrete.*	*Wood.*	*Concrete.*	*Wood.*	*Concrete.*	*Wood.*
Length, miles	307.57	4.10	307.30	4.10	.27	...
Total	311.67		311.40		.27	
Buildings:	*Number.*		*Number.*		*Number.*	
Offices	97		83		14	
Residences	636		590		46	
Power plants	29		26		3	
Pumping stations	89		69		20	
Barns, storehouses, etc	523		495		28	
Total	1,374		1,263		111	
	Number.	*Depth (feet).*	*Number.*	*Depth (feet).*	*Number.*	*Depth (feet).*
Wells	448	47,879	416	35,411	32	12,468
Communications:	*Miles.*		*Miles.*		*Miles.*	
Roads	970		955		15	
Railroads	83		83		...	
Telephone lines	3,126		2,934		192	
Transmission lines	615		450		165	
Total	4,794		4,422		372	
Power developed, water and steam	*Horsepower.* 59,633		*Horsepower.* 48,093		*Horsepower.* 11,540	
Excavation:	*Cubic yards.*		*Cubic yards.*		*Cubic yards*	
Class 1, earth	154,473,487		141,015,518		13,457,969	
Class 2, indurated material	9,913,065		9,569,457		343,608	
Class 3, rock	8,409,722		8,199,793		209,929	
Total	172,796,274		158,784,768		14,011,506	
Riprap, cubic yards	1,892,728		1,735,893		156,835	
Paving, square yards	819,408		807,485		11,923	
Concrete, cubic yards	3,023,446		2,976,448		46,998	
Cement, barrels	2,971,330		2,919,107		52,223	

Settlement.—Owing to the improved financial condition of the project farmers, due to good crops and war prices, public interest in Government irrigated lands has become very keen, and the inquiries concerning future public openings showed a marked increase during the year. The widespread hunger for irrigated Government land was shown by the number of inquiries which followed the announcement of an opening of 16 farms on the Yuma project. More than a thousand letters were received, nearly every State in the Union being represented. It was necessary to hold a drawing for every one of the farms, as 724 applicants were present at the opening.

Two small land openings occurred during the year—Newlands project, 11 farms; Yuma project, 16 farms. On June 30, 1918, there were 295 unentered farm units on all the reclamation projects. On June 30, 1919, there were 133 unentered farms. During the year there were added 27 units, so that the total number of farm units entered that year was 189. The remaining unentered farms represent the poorest tracts in the projects. Many are seeped and must be drained; others are rough or badly cut by canals and ditches.

The past year was the most active in the history of the service in the transfer of private lands on the projects. The sales by original owners in whole or in part of their ranches amounted to millions of dollars, and prices of land which a few years ago was desert and worthless ranged from $100 to $1,000 per acre. In these transfers it was noted that many of the purchasers were from other projects whereon they had been successful, and the change was made usually by reason of a desire for a milder climate. Montana farmers have sold at good prices to Mississippi Valley farmers and have transferred to Idaho and Oregon, while the Idaho farmer has joined the numbers thronging to California. With plenty of money and experience the newcomers are valuable additions to the communities in which they locate.

Land values are constantly rising on all the projects. A notable example of this is shown in the sale of State and school lands on the Belle Fourche project last April. The lands offered, 2,124 acres, were listed for sale three years ago with no purchasers, although the prices were very reasonable and the terms most generous. In the April sale every acre was sold and the competition was so keen that the prices in every case were above the minimum set by the State. Lands which in 1916 found no bidders at $12 to $20 per acre sold quickly for $20 to $50, the purchaser in each instance assuming an obligation to pay $60 per acre to the Government for a water right.

The demand of the soldiers for opportunities to acquire land overshadows everything in connection with settlement work, but it will

not be a wise policy to overlook the very urgent and increasing call for similar opportunities from citizens who were unable to wear the colors. Every consideration of good policy that can be advanced stresses the need of increasing greatly the acreage for settlers on all public-land projects as well as the taking up of new projects without delay. Neglect and long deferment of definite plans for rapid land development may still this hunger.

Including areas under Warren-Act contracts, served from Government works, the national reclamation policy has resulted in an annual crop production of $100,000,000 or over from lands which a short time ago returned nothing. To it must be attributed also the establishment of more than 200,000 people in prosperous and contented homes on the land and an equal number in the cities, towns, and villages which are the result of this agricultural development. The progress being made by these communities equals that of the most prosperous regions of our country. With millions of acres of equally favorable land awaiting development and thousands of citizens clamoring for farms, it is most important that a liberal policy in providing funds to construct the necessary works should be followed by Congress.

During the coming year land openings will occur on the North Platte and Shoshone projects, and a few additional farms will be available on the Newlands project. In December, 1919, 6,000 acres of land on the Yuma Mesa will be sold at auction. The funds derived from the sale are to be used in constructing a power and pumping plant and the distribution system. These lands are described as being practically frostless and peculiarly adapted to the production of citrus fruits.

Are project settlers permanent?—In order to determine to what degree settlement on reclamation projects is permanent, an investigation was made of a number of representative projects.

Five of the projects selected for investigation, namely, Huntley, Minidoka, North Platte, Shoshone, and Umatilla, were thought to have experienced unusually trying conditions for the settlers, and one, Boise, was thought to have been quite favorable. Letters were sent to the project managers of these six projects asking the number of original settlers still in possession and the number of transfers made by other settlers, together with any proper explanations.

Although the figures are probably not infallible, they are as nearly correct as possible. The margin of error is doubtless small in any case. The chance for greatest variation is in the number given for total farm units, because these are constantly changing and subdividing.

One of the projects, Minidoka, was also checked up by consulting the tract books in the General Land Office in Washington.

Following is a tabulation from the reports received:

Project.	Settlers still in possession, or who have satisfied homestead requirements.	Total number of settlers.	Per cent of total.	Total number of farm units.	Number of settlers per farm unit.
Boise, Idaho	987	1,273	89.1	1,107	1.14
Huntley, Mont	383	839	65.0	589	1.42
Minidoka, Idaho	899	2,709	55.8	1,609	1.68
North Platte, Nebr.-Wyo	723	2,155	54.0	1,337	1.61
Shoshone, Wyo	405	902	66.5	609	1.48
Umatilla, Oreg	136	289	69.3	196	1.47
Total	3,533	8,167	65.2	5,447	1.49

From the figures quoted it is computed that the average number of settlers to a farm unit on the Boise project, where conditions were favorable, was 1.14, or slightly more than 1—truly a remarkable showing when it is considered that farms in general often go through many changes in ownership—and only 1.68 on the Minidoka project, where conditions were adverse.

Opponents to homestead and reclamation acts have argued that settlers take up their farms merely for speculation. Although no effort has been made to learn the changes on reclamation projects after title has been obtained, results indicate slight changes during the time of proving up.

Before the end of the period required for residence, settlers may relinquish their right and for money consideration pass on the farm unit. This can safely be done only when the relinquishment paper is filed simultaneously with another entry. Any such transaction may come under the notice of the project office if the settlers are known personally. Giving up an entry does not by any means indicate that the entryman has failed to make good on his farm. It may show quite the contrary—that he has succeeded so well that he is able to sell out his improved farm for a good figure. This kind of speculation can hardly be avoided.

The first few years of the Reclamation Service were the most severe for the project settlers. Water was not available at this time, and under the law settlers could not be prevented from taking up land which might not receive water for years. Having seen how often it worked hardship for settlers to struggle along until water was ready, the service secured the passage of a law which prohibited the entering of farm units until the irrigating system is in operation, resulting unquestionably in even greater permanence of settlers on projects opened under these conditions.

The investigation has shown conclusively in connection with Federal projects that there is not the slightest basis for the statement so often and so loosely made that "throughout the newer parts of America at least three settlers in succession attempt to develop a farm before one succeeds."

Irrigation and crop results, 1918.—The usual census of irrigation and crop results on the Government reclamation projects, as described in previous annual reports, was continued during the period covered by the present report. Obviously such information is not adapted to fiscal years, and the figures that follow are for the last growing season or calendar year, that of 1918. On the Salt River project, Arizona, where some crop is growing at all times of the year, a convenient period is taken as the agricultural year, from October 1 to September 30, which date approximately marks the transition from the heavy summer production to the winter crops. On that project operation and maintenance of the works built by the Government have been turned over to the Salt River Valley Water User's Association, and in the following statistics of crop production the figures for that project are gathered and furnished by the association. Similarly on the gravity unit of the Minidoka project, Idaho, the Minidoka irrigation district handles the operation and maintenance and has compiled the crop data. On the King Hill project, in the same State, the data are furnished by the King Hill irrigation district. The poor showing on this project is due to the bad condition of the canal system, which was built under private auspices. The United States has undertaken its reconstruction, and this work is under way, but not sufficiently advanced to insure a good water supply to the bulk of the project. The Government has not undertaken operation and maintenance on this project, which are handled by the district.

It will be noted that these reports do not give the total value of farm products in that they include nothing from farm animals. The project census does not cover the income from livestock or stock products, but it is known that large additional returns are realized from sales of animals, poultry, dairy products, wool, and honey.

It should also be noted that the crop reports by no means cover the entire area to which water is made available and delivered from the works built by the Reclamation Service. In general these statistics are limited to those areas for which the United States has built a complete system from the point of storage or diversion to the laterals serving each farm and where the Government is operating such works, thus employing a force of ditch riders in frequent touch with the irrigators. This provides a ready means of gathering census data of more than ordinary accuracy and at little or no extra expense, since the time for collecting these coincides with that when the water deliveries are dwindling in the fall and the ditch riders, while still required for occasional deliveries, have less onerous duties in connection with the operation and protection of the system.

In addition to the tracts covered by the crop reports, there is a large and growing area dependent in various degrees on the Government works for water supply through special contracts, mainly

under the Warren Act, calling for delivery of water in bulk from the reservoirs, or at various stages of distribution to the land. This large area is not covered by the crop reports nor included in the following statistics though comparable in the aggregate to the area thus reported. The following tabulations, therefore, are merely summaries of the crop reports obtained and are so entitled; they fail to give, possibly by 50 per cent, the total production made possible by the works built under the reclamation law.

Summary of 1918 crop reports, by projects.[1]

State and project.	Irrigable acreage.[2]	Irrigated acreage.	Cropped acreage.[3]	Crop value.	
				Total.	Per acre.
Arizona, Salt River	[4] 212,960	[5] 205,616	184,432	$18,188,800	$98.70
Arizona-California, Yuma	73,000	45,670	45,049	5,105,132	113.32
California-Orland	20,533	14,764	12,075	709,172	58.73
Colorado:					
Grand Valley	35,000	8,102	6,387	414,310	64.87
Uncompahgre	100,000	58,270	57,310	3,302,460	57.62
Idaho:					
Boise	[6] 274,220	[6] 117,024			
Covered by census	143,780	95,074	90,720	5,154,646	56.80
King Hill [7]	14,500	1,849	1,677	45,588	27.18
Minidoka	121,392	105,061	98,182	5,168,078	52.64
Montana:					
Huntley	31,360	19,262	19,262	750,963	39.00
Milk River [8]	58,000	24,843	23,800	408,716	17.17
Sun River [9]	14,978	7,569	7,832	245,852	31.39
Montana-North Dakota, Lower Yellowstone [10]	42,232	21,075	21,000	669,191	31.85
Nebraska-Wyoming:					
North Platte:					
Interstate unit	129,778	88,771	85,308	3,100,710	36.35
N. P. C. & C. Co. lands		9,137	9,137	313,064	34.26
Fort Laramie [11]	12,132	4,865	4,865	61,815	[11] 12.71
Nevada, Newlands	71,817	42,311	41,490	1,626,142	[12] 53.15
New Mexico, Carlsbad	24,990	19,460	18,200	1,105,515	60.74
New Mexico-Texas, Rio Grande	92,300	64,781	64,002	4,237,020	66.20
Oregon-Umatilla	24,658	9,100	6,819	400,642	58.75
Oregon-California, Klamath	50,000	33,268	32,127	929,131	28.92
South Dakota-Belle Fourche	82,592	52,445	52,445	1,276,115	24.36
Utah, Strawberry Valley	50,000	32,539	29,788	1,642,327	55.13
Washington, Okanogan	10,099	6,402	5,287	749,982	141.85
Yakima:					
Sunnyside unit	98,537	84,650	70,465	7,213,392	102.36
Tieton unit	32,000	26,400	25,845	2,516,251	97.36
Wyoming-Shoshone:					
Garland unit	55,296	33,552	32,960	1,370,660	41.59
Frannie unit [11]		4,730	4,729	115,722	[11] 24.47
Total	1,732,374	1,141,516			
Covered by census	1,601,934	1,119,566	1,051,193	66,821,396	63.60

[1] Excluding substantial areas (private canals) to which water is furnished under the Warren Act. Data are for calendar year (irrigation season) except on Salt River project data are for corresponding "agricultural year," October, 1917, to November, 1918.

[2] Area Reclamation Service was prepared to supply water.

[3] Irrigated crops. Excludes small areas on few projects cropped by dry farming.

[4] Includes so-called "dry lands" given right to rent water temporarily on account of ample storage.

[5] Includes about 5,000 acres within town sites, about 11,000 acres reported "vacant" and probably largely pastured, and over 5,000 acres of "home tracts" including house lots, etc.

[6] Irrigable acreage includes New York Canal, Nampa-Meridian, and Pioneer district lands served project water. Irrigated acreage here reported is limited to area served full water supply, excluding vested right lands given partial service.

[7] Poor results on this project are due to condition of canal system, which was built under private auspices. The United States has undertaken its reconstruction; operation and maintenance are handled by the settlers through an irrigation district.

[8] Crop reports covered an additional area of 3,119 acres cropped by dry farming, producing crops worth $21,619, or $6.93 per acre.

[9] Above figures are for 187 irrigated farms, which included small tracts farmed without irrigation. In addition, crop reports covered 7 farms operated without irrigation, on which 109 acres yielded crops worth $1,998 or $18.33 per acre.

[10] Crop report covered an additional area of 5,345 acres dry-farmed, producing crops worth $60,886, or $11.39 per acre.

[11] New lands, first year of irrigation.

[12] For crops in full production, excluding 9,662 acres of wild-grass pasture and 3,081 acres otherwise not in full production. For all crops, $39.30.

However, a summary of the crop reports received gives some impressive figures of the values that have been secured from the desert lands by the provision of irrigation water. The following table summarizes the reports by projects, and it will be noticed that for several of these the crop values produced average over $100 per acre. These averages are for all farms and all crops in the large tracts covered by the census, including the least successful with the most successful irrigators, and averaging with banner crops those of low yield or any of entire failure due to pests or other causes. The average returns per acre therefore are an index for a large area in each case, and far greater results are secured by many of the most skilled and successful settlers.

For all projects the crop reports show a gross value of over $66,000,000, or an average of $63.60 for each of the 1,050,000 acres cropped. These reports covered an irrigated acreage of 1,119,000 and 1,600,000 acres that were irrigable, i. e., for which the works were ready to supply water. This does not, however, indicate a failure to utilize 500,000 acres and the water ready for it as shown in the preceding discussion.

For the Salt River project, Arizona, the Water Users' Association reported a total crop value of over $18,000,000. Under the contract by which the association assumed the operation and maintenance of the works and agreed to reimburse the United States for their construction, the amount fixed for the latter purpose is approximately $10,279,000. Thus the crop value in a single year is more than 150 per cent of the construction cost the association is to repay to the United States over a period of 20 years, and most of which will be supplied by power profits from the project works.

On some of the other projects the development has reached the stage where the annual crop value is comparable to the total cost of building the irrigation works. The Minidoka project, Idaho, which cost about $5,700,000, yielded crops in 1918 worth $5,160,000. Prior to the Government work the project was entirely sagebrush desert. The Yakima project, Washington, costing to date about $10,000,000, yielded crops worth $9,733,000 in 1918.

In the following table the crop reports are summarized by crops and comparison with similar tabulations for previous years shows relatively small changes in the general character and relative importance of the crops grown. Alfalfa continues as the great basic crop, occupying 40 per cent of the crop area and furnishing one-third of the total crop value. Wheat advanced from 12 per cent in 1917 to 16 per cent of total crop area reported in 1918. The acreage in cotton on the southwestern projects doubled. Eight million bushels of

grain, a like amount of vegetables and truck, 165,000,000 pounds of fruit, and 267,000 tons of sugar beets were harvested from the lands covered by the crop reports. But over half the crop area was devoted to hay and forage crops, largely converted to animal products by feeding on the projects.

Summary of crop reports on reclamation projects in 1918.

Crop.	Acreage cropped.		Yields.			Crop value.		
	Total.	Per cent.	Unit.	Total.	Average per acre.	Average per acre.	Total.	Per cent.
Cereals:								
Barley	29,698	2.8	Bushel	876,070	29	$36.20	$1,074,768	1.6
Corn	31,944	3.3	do	1,017,090	29	48.50	1,674,496	2.5
Oats	46,951	4.5	do	1,300,410	28	25.00	1,176,413	1.8
Rye	1,942	.2	do	20,010	10	15.30	29,741	.....
Wheat	166,138	15.8	do	3,708,170	22	43.10	7,164,646	10.7
Total	279,673	26.6	do	6,921,850	25	39.60	11,120,064	16.6
Other grain and seed:								
Alfalfa seed	9,231	.9	do	41,100	4.5	51.50	502,796	.8
Clover seed	8,884	.8	do	35,060	4.0	71.00	630,855	1.0
Grain sorghum	27,326	2.6	do	1,028,040	38	64.40	1,759,718	2.6
Flax seed	1,710	.2	do	10,330	6	19.80	33,920	.....
Millet seed	642	.....	do	15,840	25	24.90	15,975	.....
Total	47,793	4.5	do	1,130,370	.....	61.60	2,943,264	4.4
Hay and forage:								
Alfalfa hay	419,612	39.9	Ton	1,318,780	3.1	54.10	22,720,050	[1] 34.0
Clover hay	7,290	.7	do	14,500	2.0	25.30	184,455	.3
Other hay	30,340	2.9	do	42,250	1.4	25.40	767,385	1.1
Corn fodder	5,234	.5	do	18,110	3.5	24.50	127,864	.2
Peas	308	.....	Bushel	4,830	16	38.80	11,960	.....
Other forage	3,779	.4	Ton	25,680	7	56.80	214,751	.4
Pasture	113,637	10.8	.....	.....	.....	[1] 15.20	1,730,959	2.6
Total	580,200	55.2	.....	.....	.....	44.40	25,757,454	38.6
Vegetables and truck:								
Beans	10,711	1.0	Bushel	141,150	14	54.30	581,642	.9
Onions	407	.....	do	98,660	242	163	66,361	.1
Potatoes, white	28,332	2.7	do	4,484,370	158	133	3,775,503	5.7
Potatoes, sweet	209	.....	do	18,920	91	105	21,938	.....
Truck	11,635	1.1	.....	.....	.....	146	1,701,289	2.5
Total	51,294	4.9	.....	.....	.....	120	6,146,733	9.2
Fruits and nuts:								
Apples	26,121	2.5	Pound	97,299,240	3,725	107	2,809,129	4.2
Peaches	1,995	.2	do	6,612,480	3,310	110	219,229	.3
Pears	3,449	.3	do	21,265,500	6,160	194	668,956	1.0
Prunes	633	.1	do	3,512,430	5,550	255	161,071	.2
Citrus fruits	2,151	.2	do	13,571,160	6,310	253	544,946	.8
Small fruit	987	.1	do	1,803,590	1,830	203	200,978	.3
Miscellaneous	2,643	.2	do	21,778,320	8,240	272	718,958	1.1
Total	37,979	3.6	do	165,842,720	4,365	140	5,323,267	7.9
Miscellaneous:								
Sugar beets	27,133	2.6	Ton	267,130	9.9	101	2,731,871	4.1
Cotton	86,470	8.2	Pound	60,412,540	700	141	12,193,480	18.3
Cane	4,300	.4	do	18,980	4.4	66.60	286,340	.4
Other crops	16,826	1.6	Ton	.....	.....	18.90	318,952	.5
Total	134,729	12.8	.....	.....	.....	115	15,530,643	23.3
Duplication	89,475	7.6	.....	.....	.....	.....	.....	.....
All crops	1,051,193	100.0	.....	.....	.....	63.60	66,821,396	100.0

[1] This figure does not represent average value of pasture for a year or season, as considerable areas pastured were also harvested and are included in the duplicate area.

BUREAU OF MINES.

Purpose of the Bureau of Mines.—Established by Congress (37 Stat., 681) in 1910 for the purpose of conducting scientific and technologic investigations concerning mining and the preparation and utilization of mineral substances, with a view to the increase of health, safety, and efficiency in the mineral industries, the Bureau of Mines is studying mine gases, rescue, and first-aid training for miners, the utilization of coal and other fuels with greater efficiency, the development of ways to use domestic minerals in place of minerals formerly imported, the prevention of waste in the production, transportation, and utilization of petroleum and natural gas, and the development of processes and methods whereby deposits of minerals now unworked may become available as sources of supply. In addition the bureau during the fiscal year conducted special investigations relating to new methods of producing various substances, administered the provisions of the law controlling the manufacture, sale, possession, and use of explosives during the war, and gathered and disseminated information in regard to sources of supply of economic minerals throughout the world, the political control of these minerals, and the variations in demand at the principal markets from month to month. In the course of this work the Bureau of Mines cooperated with various departments, bureaus, and Government establishments.

Cooperative agreements.—In its endeavor to act most effectively with State agencies seeking the improvement of efficiency and the lessening of accidents in the mineral industries, the Bureau of Mines, with the approval of the Secretary of the Interior, had made cooperative agreements with State organizations and with State universities and mining schools. During the fiscal year, ended June 30, 1919, investigations relating to safety and efficiency in the mineral industries were conducted under cooperative agreements with the bodies named, as follows: University of Arizona, Tuscon, Ariz.; Industrial Accidents Commission of California, San Francisco, and University of California, Berkeley, Calif.; University of Idaho, Moscow, Idaho; Colorado School of Mines, Golden, Colo.; engineering experiment station of the University of Illinois, Urbana, Ill., and Illinois Geological Survey; University of Minnesota, Minneapolis, Minn.; Ohio State University, Columbus, Ohio; Oregon Bureau of Mines and Geology; Industrial Commission of the State of Utah and State School of Mines of the University of Utah, Salt Lake City, Utah; University of Washington, Seattle, Wash.

Mine experiment and mine safety stations.—The bureau has 11 mining experiment stations, 9 mine safety cars, and 7 mine safety stations. The mining experiment stations are investigating mining and metallurgical problems; the mine safety stations are instructing

miners in first-aid and rescue methods, and in giving assistance after mine disasters. The mining experiment stations are at Pittsburgh, Pa.; Columbus, Ohio; Urbana, Ill.; Minneapolis, Minn.; Bartlesville, Okla.; Salt Lake City, Utah; Golden, Colo.; Tucson, Ariz.; Berkeley, Calif.; Seattle, Wash.; and Fairbanks, Alaska.

The mine rescue or mine safety stations are situated at Pittsburgh, Pa.; Vincennes, Ind.; Norton, Va.; Jellico, Tenn.; Birmingham, Ala.; McAlester, Okla.; and Seattle, Wash. The mine safety cars have headquarters at Pittsburgh, Pa.; Huntington, W. Va.; Ironwood, Mich.; Terre Haute, Ind.; Pittsburg, Kans.; Butte, Mont.; Raton, N. Mex.; Rock Springs, Wyo.; and Reno, Nev. The bureau also maintains four motor rescue trucks—one at Pittsburgh, Pa., one at Birmingham, Ala., one at Vincennes, Ind., and one at Seattle, Wash.

War work.—At the beginning of the year the bureau was centering its efforts on war work. In this work the bureau cooperated with the War Department, Navy Department, Department of Agriculture, United States Fuel Administration, National Research Council, United States Shipping Board, Capital Issues Committee, Council of National Defense, War Industries Board, Bureau of Standards, and with other bureaus of the Interior Department.

The work included investigations of minerals, ores, and metals especially needed, cooperative work for the Army and the Navy, and various investigations relating to fuels.

The most noteworthy undertaking was the development of a process for recovering helium, for use in balloons and airships, from natural gas. This work, begun the year before in cooperation with the War and Navy Departments, resulted in the production of 150,000 cubic feet of helium before the signing of the armistice, and demonstrated the merits of the Bureau of Mines, or Norton process, plant for the recovery of helium.

Under an allotment of funds from the Ordnance Department of the Army the Bureau of Mines designed and supervised the construction of a large plant at Saltville, Va., for the manufacture of sodium cyanide by the Bucher process.

During the year the War Department erected at Sheffield, Ala., a plant for the oxidation of nitric acid from ammonia. The apparatus in this plant, which was more efficient than any hitherto devised, was the result of experiments conducted under the direction of the Bureau of Mines, in cooperation with the Ordnance Department and the Semet Solvay Co., at Syracuse, N. Y.

War minerals investigations.—Minerals and metals especially needed during the war included manganese, chrome, tungsten, pyrite, tin, graphite, and potash. The bureau up to the signing of the armistice was examining deposits of these minerals and study-

ing methods of mining, treatment, and utilization. About 100 persons were engaged in this work, of whom about 90 were mining engineers, metallurgists, or chemists. About 60 per cent of these men were engaged in the staff and field work of the larger investigations; the rest were consulting engineers working on special problems. After the armistice the bureau continued to give attention to market conditions and to economies in treatment, with the purpose of enabling producers to meet the conditions brought about by the great decrease in demand consequent on the cessation of hostilities.

War minerals relief commission.—A rider attached to the Dent military bill (Public 322), approved March 3, 1919, authorized investigation and payment of net losses incurred by producers of manganese, chrome, pyrite, and tungsten, when such losses had been incurred as a result of Government request. The maximum amount to be expended for such relief was limited to $8,500,000. A commission of three members is reviewing the claims and making the awards. The Secretary of the Interior authorized the Director of the Bureau of Mines to conduct the field engineering and accounting investigations, also the office routine and administrative work for the commission.

Explosives regulation.—By the provisions of the act regulating the manufacture, distribution, storage, use, or possession of explosives and their ingredients during the war (Public 68, H. R. 3932), the Bureau of Mines, under rules and regulations approved by the Secretary of the Interior, exercised wide powers. When the armistice was signed it had appointed more than 14,000 carefully selected licensing agents throughout the United States and its insular possessions, and had issued about 1,000,000 licenses. In administering the act the bureau sought to stop careless practice in the use of explosives, examined magazines throughout the country in order to prevent storage of explosives under dangerous conditions, investigated violations of the act and of outrages against life and property, and took steps to have offenders punished. After the signing of the armistice some of the regulations for carrying out the purposes of the act were made less stringent.

Regulation of platinum.—Because of the imperative need of platinum in the manufacture of chemicals and munitions and the inadequate supply of the metal, Congress by the act of July 1, 1918 (Public 181), authorized the Director of the Bureau of Mines, under rules and regulations approved by the Secretary of the Interior, to limit during the period of the war the sale, possession, and use of platinum, iridium, palladium, and compounds thereof. Because of the signing of the armistice the restrictions imposed through this act were removed by the director of the bureau, with the approval of the Secretary of the Interior, on November 14, 1918.

Administrative divisions.—For purposes of administration the technical and scientific work done by the bureau at its Washington office and at its various mining experiment stations was grouped in five divisions, as follows: Mining, fuels and mechanical equipment, metallurgy, mineral technology, and petroleum technology. Each of these divisions was under a chief who reported to the director. The work on war minerals, organized as the war minerals investigation, was placed in a separate division, as was that on explosives' regulation. Each of these divisions had its headquarters in Washington. The work done at the experiment stations was under the general direction of the supervisor of experiment stations, who had headquarters in the Washington office.

During the fiscal year the mining division conducted various investigations regarding health, safety, and efficiency in coal mining and metal mining, had charge of the training and rescue work done through the mine safety stations and cars, and supervised Federal mine inspection in Alaska and on Indian lands; the metallurgical division carried on investigations relating to the prevention of waste and the increase of efficiency in the treatment of ores and of various metals, nearly all this work being done through the experiment stations; the mineral technology division had charge of work on alloy steels and of some special work for the War and Navy Departments, practically all of the mineral technology work of preceding years being transferred to the war minerals division; the division of petroleum technology had charge of work dealing with the increase of safety and efficiency in the production, handling, and utilization of natural gas, petroleum, and petroleum products.

At the end of the year the organization of the bureau was being changed so as to have all research work segregated in a research branch and all work dealing with operation and administration routine in an operations branch.

Mine rescue and first-aid training.—Through its mine safety stations and cars, the bureau renders aid at mine disasters and trains miners in first-aid methods and the use of rescue equipment. During the fiscal year ended June 30, 1919, the men attached to these stations and cars investigated the causes of 29 mine accidents—19 at coal mines and 10 at metal mines—and trained 9,781 miners in first aid and rescue methods. Nearly 65,000 miners have received training through the cars and stations since the beginning of this work by the Government.

Mine explosions and fires.—At the experimental mine of the bureau, near Bruceton, Pa., work relating to the causes of mine explosions and methods of prevention was continued. Various explosives were tested to determine their permissibility for use in gaseous or dusty coal mines; 2 of these were approved, and the permissible

list at the end of the year contained the names of 162 explosives. More than 37,000,000 pounds of these explosives were used in the coal fields of this country during the calendar year 1918, as compared with 2,000,000 pounds of similar explosives in 1908, the year in which the testing of mine explosives by the Government began. The total quantity of permissible explosives used throughout the United States in the calendar year 1918 was 46,045,233 pounds. Explosion-proof equipment for mines was tested and approved.

Health of miners and sanitary conditions at mines.—In cooperation with the Public Health Service the bureau continued work relating to the health of miners and to sanitary conditions at mines. Especial attention was given to ventilation conditions in mines in Arizona. Owing to the need of surgeons in the Army and the influenza epidemic, the cooperative work of the Public Health Service had to be curtailed in the early part of the fiscal year. During the epidemic the crews of several of the cars rendered efficient service in caring for the sick. In the latter part of the year two surgeons of the Public Health Service, each assigned to one of the new mine safety cars of the bureau, examined miners as to their fitness for mine-rescue work, gave public lectures on matters relating to first aid, sanitation, and hygiene, made sanitary inspections at different mines and mining communities, and suggested to owners or operators the improvement of conditions so as to lessen the risk of preventable or occupational diseases.

Fuel investigations.—In its efforts to increase efficiency in the use of coal and lignite the bureau is studying the properties of these fuels and the methods of burning coal, lignite, and coke in boiler and house-heating furnaces. Also it is collecting, analyzing, and testing samples of coal belonging to or for the use of the Government. During the year the bureau assisted in an advisory capacity the Fuel Administration and various departments and establishments of the Government in solving problems relating to the efficient use of fuel for heating or power. It had charge of tests of marine boilers for the Emergency Fleet Corporation, and as a result of these tests changes were made in the methods of baffling the boilers and of admitting air to the furnace, which increased the efficiency of certain boilers 16 per cent. Toward the end of the fiscal year, under an appropriation of $100,000 by Congress, the bureau began a comprehensive investigation of the best methods of utilizing the great beds of lignite in Texas, the Dakotas, and other States, this investigation to include the erection of a plant for carbonizing lignite and producing gas as a by-product.

Increasing efficiency and lessening waste in the petroleum and natural-gas industries.—Through its petroleum division the Bureau of Mines is investigating problems of petroleum and natural-gas technology. These problems are grouped in four classes, as fol-

lows: Production technology, including methods of preventing infiltrating water from entering oil and gas sands through wells, the determination of the ultimate production and hence the value of oil lands, the occurrence and relation of gas, oil, and water in different fields, and the preparation of refinery statistics: engineering technology, including waste of oil in storage and transportation, the prevention of gas and oil well fires; investigations of refinery practice, the recovery of gasoline from natural gas, the production of carbon black from natural gas, and economy and efficiency in the use of oil fuel; chemical technology, including the routine examination of samples of fuel oil and gasoline, the preparation of specifications for petroleum products, the inspection of gasoline for military use overseas, the character of the motor gasolines sold throughout the country, the study of cracking processes for making gasoline; and oil-shale technology, including a review of the oil-shale situation in the United States and the work being done at distillation plants erected by private concerns. In addition members of the petroleum commission served on various war-time boards and commissions, including the Interallied Petroleum Conference.

Government fuel yards.—The sundry civil act approved July 1, 1918 (Public 181), carried among the appropriations for the Bureau of Mines an appropriation of $432,300 for the establishment of fuel yards in the District of Columbia for the use of all branches of the Federal service and the municipal government in the District of Columbia, and also an appropriation of $1,154,088 for the purchase and transportation, storing, and handling of fuel, and the maintenance and operation of the yards and equipment.

During the year a yard with storage capacity of 20,000 tons was equipped and put in operation under the direction of the Bureau of Mines. The equipment comprises hoppers, bins, and belt conveyors. The approximate cost of the yard and its equipment was $260,000. For distributing the coal to the various buildings in the District a fleet of 33 motor trucks was purchased. During the fiscal year 247,540 tons of fuel were purchased, 165,669 tons being handled by the trucks.

Bartlesville experiment station.—The Bartlesville station is giving all its time to problems of the petroleum and natural-gas industries. Two brick buildings for the station were completed during the year. The research work done through the station included investigation of the use of the absorption process for recovering the residual gas from compression plants for obtaining gasoline from natural gas; investigations and demonstrations of methods of preventing water from entering gas and oil sands through wells; an investigation of the manufacture of carbon black from natural gas, with regard to the possible development of more efficient methods of production; an

investigation of the loss of the lighter hydrocarbons from crude oil during storage, one of the great losses in the petroleum industry; and an investigation to ascertain a practicable method of recovering oil from emulsified mixtures of oil and water.

Berkeley experiment station.—The work of the year included various war mineral problems; problems relating to the treatment of quicksilver ores; and investigations of the volatility of metallic compounds, with especial reference to the volatilization processes of ore treatment that were being developed at the Salt Lake City station.

Columbus experiment station.—The Columbus station is situated at the Ohio State University. New quarters erected by the university for the station were ready for occupancy in October, 1918. The chief investigations for the year were as follows: Crucible-making properties of American graphites and bond clays as compared with foreign materials; physical properties and pottery-making values of American white clays as compared with imported white clays; possible development of a suitable refractory from domestic dolomite as a substitute for imported magnesite; cooperative work with the United States Geological Survey, in the investigation of clays throughout the country; ceramic-equipment design, with a view to improving the efficiency of apparatus and equipment used in ceramic industries; cooperative work with the Ohio geological survey in an investigation of the refractory fire clays of the State; spalling tests of fire brick.

Fairbanks experiment station.—The station at Fairbanks, Alaska, investigated the value of Nenana lignite as boiler fuel, and the possibility of using the lignite as fuel for a central electric-power station with transmission lines to near-by mining districts. The station also made tests of the possible recovery of gold from heavy sands remaining in sluice boxes after a clean-up; the concentration of chromite in beach sands; the flotation of molybdenite from low-grade ores, and the concentration of gold-bearing antimony ore.

Golden experiment station.—Most of the work of the Golden station is on rare metals. During the year the investigations of radium included the study of the chemical effects of radium emanation in gas reactions. Work on zirconium resulted in the preparation of samples of the pure metal and the determination of its properties. A cooperative investigation of the recovery of molybdenite from ores by flotation resulted in the development of methods that increased the recovery at the mill of the cooperating company 15 to 20 per cent. Other work on molybdenum included the metallurgy of wulfenite and the separation of wulfenite from baryte. A method was devised for commercially treating cuprodescloizite, a mineral containing lead, vanadium, and copper, and methods for treating vanadinite (lead vanadate) were investigated. Considerable work

was done on phosphorescent zinc sulphide, used with radium luminous paint, to discover the causes of luminosity.

Minneapolis experiment station.—Problems connected with the treatment of manganese ores and the production of managese alloys received chief attention during the year. The investigations conducted were as follows: Examination of the manganiferous iron mines of the Cuyuna Range, Minnesota; ore-dressing tests of manganiferous ores from various places in the United States; blast-furnace practice for the production of ferromanganese and spiegeleisen; use of manganese alloys in open-hearth steel practice; the Jones process for the direct reduction of manganiferous iron ores and recovery of the manganese; the Bourcoud process for the direct reduction of iron ores; mining methods in the Lake Superior region; analytical work on steels, slags, and alloys; and an investigation of low-grade sulphide gold ores in the Black Hills, S. Dak.

Pittsburgh experiment station.—The work of the Pittsburgh station, the largest of the experiment stations, comprised mining problems, including first-aid and rescue methods, fuel problems, petroleum investigations, and chemical research. The mining investigations included tests of the explosibility of coal dust and of methods of preventing or stopping mine explosions; tests of explosives and of electric equipment to determine their permissibility for use in dusty or gaseous coal mines, tests of geophones, or listening devices for mine rescue and other purposes; explosives research for the War Department; and tests to determine the value of T. N. T. as an explosive for engineering and industrial use. The fuel investigations related chiefly to the cumbustion of fuel in boiler and house-heating furnaces, heat transmission in boilers, boiler and furnace design, the use of coke as a household fuel, and the use of powdered coal. Petroleum investigations included routine analyses of oils and greases, tests of samples of gasoline collected throughout the United States, and the development of apparatus and methods for the analysis of petroleum and its products, and an investigation of the after corrosion of Army rifles. Chemical research work included the devising of methods of analyzing graphite; tests of the fusibility of ash of coal from different fields; routine analyses of coal and coke, mine gases, natural gas and fuel gases; chlorination of natural gas for the production of chloroform and carbon tetrachloride; tests of odors for use as danger signals in the compressed-air lines of metal mines; tests of gas masks and respirators for mining or industrial use; devising of portable indicators for detecting various gases; and the sampling and examination of rock dust in the atmosphere of metal mines.

Salt Lake City experiment station.—At this station, under a cooperative agreement with the University of Utah, various improvements were made in facilities and equipment and much new apparatus

was added, especially apparatus for the ore-testing laboratory. The work of the year comprised various war minerals investigations, including concentration tests of chrome, quicksilver, and manganese ore, methods of refining graphite, recovery of potash from alunite; research work on oil shales; precipitation of zinc from hydrometallurgical solutions and recovery of metals from ores by the volatization process.

Seattle experiment station.—During the early part of the year work was mainly on war minerals investigations, chiefly concentration tests of chrome and manganese ores; during the latter part of the year regular investigations were resumed. In cooperation with the University of Washington four groups of investigations are being conducted, as follows: Coal, electrometallurgy, flotation, and ceramics. The coal investigations comprised mining methods in Washington, the causes of "bumps" or air blasts in coal mines, Alaskan coal problems, standardization of float and sink tests in coal washing, and the storage and use of pulverized coal. Electrometallurgical investigations were hampered by nonarrival of equipment for the laboratory. Work was done on the recovery of valuable minerals from ores by flotation, and methods were devised for determining molybdenum in ores and titanium, and chromium in beach sands. In cooperation with the Oregon Bureau of Mines and Geology chrome deposits in Oregon were examined and flotation tests made with a silver-gold ore.

Tucson experiment station.—The offices and laboratories were moved into new buildings of the University of Arizona, and the new metallurgical laboratory was equipped. The principal work of the station dealt with the leaching of mixed sulphide and nonsulphide porphyry copper ores. The war minerals investigations were chiefly the investigating of manganese resources and the concentration and leaching of low-grade siliceous manganese ores.

Urbana experiment station.—Investigations in progress during the year included the study of surface subsidence resulting from coal mining in Illinois, the origin and control of mine fires, the composition of coal-mine atmospheres, the occurrence of sulphur in coal, a general investigation of coal-washery practice in the Middle West with a view to the improvement of existing methods, a general study of water-gas manufacture with especial reference to the use of Illinois coal, and the possibility of making wider use of coal brasses (pyrite) in the manufacture of sulphuric acid.

Ithaca office.—The field office at Ithaca, N. Y., worked on two main problems—electric smelting of manganese ores and the preparation of special alloy steels for the Army and Navy.

Moscow office.—In cooperation with University of Idaho the Bureau of Mines maintained a field office at Moscow. The work of

this office included investigations of the treatment of complex lead-zinc sulphide and copper-iron sulphide ores with reference to the recovery of the valuable metals by differential flotation, and the treatment of antimony ores by sulphidizing followed by flotation.

NATIONAL PARK SERVICE.

The tremendous popularity of our national parks was fully attested by the unprecedentedly large number of visitors during the 1919 season, which closed about the middle of September. Freed from the restrictions against war-time travel, which had been a war necessity, the appeal of the great natural attractions of the parks was irresistible and the response spontaneous. The national parks became the cynosure of the eyes of a war-weary and hard-worked people, bent on taking a holiday where they could derive the greatest benefits. There the refreshing atmosphere of the great Out of Doors, the soothing diversion of the natural scenery, and the specific qualities of the fresh air brought mental and physical relief to hundreds of thousands. When one considers that travel to our national parks and monuments exceeded 810,000 visitors—over 755,000 to the parks and over 55,000 to the monuments—it is evident that the recreative value of the parks is a tremendous factor in the health, wealth, and contentment of the Nation.

The following tables will give an itemized review of the travel:

Visitors to the national parks in 1919.

Hot Springs	[1] 160,490
Yellowstone	62,261
Sequoia	30,443
Yosemite	58,564
General Grant	21,574
Mount Rainier	55,232
Crater Lake	16,645
Wind Cave	26,312
Platt	[1] 25,000
Sullys Hill	4,026
Mesa Verde	2,287
Glacier	18,956
Rocky Mountain	169,492
Lassen Volcanic	[1] 2,500
Hawaii	([2])
Mount McKinley	([2])
Grand Canyon	37,745
Lafayette	[1] 64,000
Total	755,527

[1] Estimated. [2] No record.

Visitors to some of the national monuments in 1919.[1]

Capulin Mountain (New Mexico)	[2] 1,500
Casa Grande (Arizona)	3,795
Colorado (Colorado)	[2] 3,000
Muir Woods (California)	[2] 43,200
Petrified Forest (Arizona)	[2] 3,000
Zion (Utah)	1,814
Total	55,309

Analysis of park-travel figures.—An analysis of these figures shows that the travel in 1919 was 67 per cent over that of 1918 and 54 per cent more than that of the previous high-water mark in park travel of 1917. An astounding increase occurred also in motor travel to the national parks. The increase of the number of cars, 95,140 in 1919 over that of 55,296 in the record year 1917, is 72 per cent. While no accurate general record is kept in all the parks of the number of tourists entering in motor cars, in Yellowstone it is found that they average about four to the car, as will be seen from the following tables for the past three years:

Year.	Number of private cars.	Number of tourists.
1917	5,703	21,268
1918	4,734	17,317
1919	10,773	40,986

With this average in mind it is estimated that about 400,000 visitors entered the parks and monuments by motor. The travelers came from every State in the Union and from foreign countries, and the motorists from every corner of the country and from Canada and Mexico. Some of the motorists visited all of the national parks of the continental west and others toured from two to five. More than half carried their own supplies and camp equipment, and they enjoyed the playgrounds in their own way.

Conventions in the parks.—Conventions in various parks during this year of tremendous travel were the cause of some overcrowding of hotel and camp facilities. It may be necessary in the future to restrict the holding of conventions in the parks until the hotel and camp facilities can be extended beyond their present capacity. The aim is first of all to accommodate the traveling public. Among the conventions held in the parks were those of the Montana Bankers' Association, in Yellowstone Park; the Washington Bankers' Association, the West Coast Lumbermen's Association, the Association of Western Confectioners, the Knights of Pythias, the Order of the Eastern Star, in Mount Rainier; and the Native Sons of the Golden West in Yosemite.

Cooperation of United States Railroad Administration.—In these large travel figures the influence of the activities of the United States

[1] No records for other 17 national monuments. [2] Estimated.

Railroad Administration is also reflected. During the war travel was discouraged. Soon after the cessation of hostilities, however, the administration changed to a stand just opposite to the former policy, and by judicious advertising and education of those of its employees who come in direct contact with the tourists, stimulated the patronage of the winter resorts in the South and West to unusually gratifying proportions. Later, through its passenger traffic committee, it directed its efforts toward the summer resorts of the country with special emphasis on the national parks. The promotion of park travel, of course, fell naturally to the western committee of the railroads and to the Bureau of Service, National Parks and monuments, with headquarters at Chicago. This latter bureau was well organized and prepared to perform its functions without delays when the restrictions were raised. By attractively designed and well-written national park booklets they presented a feature of their campaign that offered at once the most important inducement to travel in the parks that has appeared since the publication of the National Parks Portfolio some three years ago. The very satisfying result achieved by this bureau testifies to its great importance and the extreme desirability of its surviving as one of the institutions of the Railroad Administration whenever the railroads are turned over to private operation.

Touring and industry.—At this writing restrictions against overseas travel have also been removed. The competition of Europe for tourist travel will begin with renewed activity. We have in this country scenery that is the peer and in most instances the superior of that found abroad, but the value of tourist travel as an industry has hardly been recognized in this country. Various industries of the United States are protected as a matter of course, but what protection will the great resorts of this country have from the greatest campaign for tourist travel in foreign lands that will ever have been waged? As a nation we have failed to grasp the significance and value of the tourist industry. Every dollar of revenue received from it stays here. Before the war Americans spent in England alone about $200,000,000 a year, and in France and Switzerland $400,000,000. We should develop this industry, as other countries are doing, into one of our biggest economic assets.

The need of a touring agency.—To properly develop this the establishment of a touring agency is a present national necessity. It is vitally important to the Nation, and, as there is no other agency of the Government that is so interested or so closely in touch with the traveling public as the National Park Service, the agency should be established there. Such an activity could cooperate closely with the resorts of the United States, the railroads, automobile associations, highway associations, mountaineering clubs, etc. Promotive

literature bearing the stamp of approval of the department and of the National Park Service would most effectively stimulate and maintain travel in the United States, because its data would not be selfish or exaggerated and would have the confidence of everybody using it.

The national parks in the field of education.—The dissemination of information regarding the national parks and national monuments, aside from its value from a tourist standpoint, has maintained its high place in the educational field. While no entirely new literature regarding the national parks has been issued, the existing circulars for all of the parks were published in considerably increased editions. During the year 185,000 of such publications were issued and approximately 167,500 have been distributed. Mountaineering in Rocky Mountain National Park by Supt. Roger W. Toll, of Mount Rainier Park, and Wild Animals of Glacier National Park by Vernon Bailey and Florence Merriam Bailey, compiled last year, were available for distribution during the season. A new edition of the popular pamphlet, Glimpses of Our National Parks has been prepared and another pamphlet, entitled Glimpses of Our National Monuments, is in course of preparation; these will be available for next season's work. Large editions of automobile maps were widely distributed. Popular publications on the wild life of Mount Rainier National Park, the flora of Glacier National Park, and the bird life of Papago Saguaro National Monument and adjoining regions will be ready during the coming winter months. Copy for an information circular on Zion Monument has been prepared. The value of the parks and monuments for profitable summer investigations in numerous branches of scientific and historic research is more and more apparent. Columbia University has definitely opened a field of national park study as a distinct feature of its curriculum; it is conducting a course in the scenery of the national parks with special emphasis on its creation by the forces of nature that have developed the surface of the earth and are still engaged in modifying and changing it.

During the summer the University of California through its extension division established a course of lectures on national parks, which are to be given every year in Yosemite Valley. These are to be known as the Le Conte Memorial Lectures, in commemoration of the late Joseph Le Conte's devotion to the national parks and his contributions to science. The lectures were popular and well attended. The next season's series are already being printed.

Camp-fire talks, such as were given by Dr. Matthes of the Geological Survey, at popular camps in Yosemite and at the Sierra Club camp fires by Dr. J. Walter Fewkes in the Mesa Verde National Park, and by other men interested in this educational extension work

prove intensely interesting features of the education of the visitors to a real appreciation of the meanings of the natural formation in the parks. The opportunities for field laboratory work in the parks for students are unlimited and the endeavor will be to have these opportunities developed in an increasing degree from year to year.

Establishment of museums.—The museum established at Mesa Verde National Park to house relics taken from the cliff dwellings and other prehistoric buildings of the park has become one of the most interesting and enjoyable features of the reservation. In the plans for a new administration building for Yosemite Park provision was made for a large museum to be constructed with every modern appliance for effective exhibitions. In Yellowstone National Park a large room in one of the buildings selected for headquarters will be developed as a museum to house specimens of the hundreds of different objects of interest that the park contains. At the Casa Grande National Monument a collection of prehistoric implements and other relics of interest, together with a library of archeology and ethnology, has been assembled. In Rocky Mountain Park collections of specimens of wild flowers and exhibits of mounted birds and animals are attracting attention. This work promises to be of great value to the public and will create a true understanding of the historic aspects and wild life of the parks. Supplemented by the various publications put out during the year, such as Wild Animals of Glacier National Park and similar educational papers, the attractions and biological history of these areas will be available to the public in varied form. The Biological Survey under the Department of Agriculture, the University of Washington, and the National Park Service are cooperating at this writing in the gathering of data for popular articles on the wild life of Mount Rainier National Park, and the Smithsonian Institution is assembling data for a book on the flora of Glacier Park.

Film and pictorial service.—The National Park Service has maintained a wide circulation of pictures, films, lantern slides, and other pictorial material. The demand for these, while not as heavy as prior to the war, was still very extensive. The great interest in the national parks shown by organizations and societies is fully evidenced by the continued demands for such material. Travel exhibits of national park pictures are constantly on view in various cities. Money is needed for more material of this kind so that the rapidly increasing demand may be met. All these parks are reservations for wild animals; they contain some of the finest game preserves in the world. With few exceptions, the wild animals of the park have thrived splendidly. The open winter helped to make raising conditions good. Toll taken by poachers and the occasional results of sporadic epidemics, of course, make certain inroads each year. It is particularly

important that appropriations become available for the administration of Mount McKinley National Park in Alaska, which was created primarily to protect its splendid animal life. Complete jurisdiction of the United States over the California and Colorado parks should also be speedily effected to protect the wild animal life. It is also highly important that a number of States give attention to the establishment of game preserves adjoining the national parks, particularly in California; these are essential to the preservation of the growing herds of animals after they leave the park boundaries, and particularly in the wintertime, when cold and scarcity of food drive them into the lowlands outside of the existing park boundaries and beyond our present protective care. Unusual success was experienced in killing of predatory animals; so much so that there has already been a noticeable increase of the deer and other species that are usually their victims.

Fishing a favorite sport in the parks.—Fishing in the parks was excellent during part of the season, but the large number of tourists enjoying the sport greatly depleted the stock. Large consignments of fry were planted in practically all the parks, but this operation will have to be conducted on a larger scale in the future. The cooperation of the United States Bureau of Fisheries and some of the States in this phase of park development was particularly gratifying. Good fishing for the visiting public is one of the most appealing diversions offered by the parks, and opportunities for following this sport will be intensively improved.

Park-to-park highway.—The immense value of a park-to-park highway is becoming yearly more apparent. Where in former years relatively few communities were in favor of it, now there is a wide demand for such a connecting link between these scenic areas. Motorists find that in almost every town along the routes from their homes to the parks or between the reservations themselves a well-kept automobile camp is established which they are privileged to use free of charge. Many of these camps are adequately equipped and wood is nearly always available; of course, small charges are made in places to cover the cost of wood or other fuel. The automobile camp of the western towns and cities is now an institution and a particularly enjoyable adjunct of park-to-park travel. The first extensive park-to-park trip to be made by using the special transportation facilities provided by the Yellowstone Park Transportation Co. and the Glacier Park Transportation Co. was made by a party organized by and under the guidance of the Brooklyn Eagle, which undertook the trip in July and early August. The trip was a great success.

In connection with the park-to-park highway travel it was very interesting to note the large numbers of parties traveling between the parks on trains. While no record is available of the number who

traveled by this means, several large bodies, such as the Travel Club of America, the Massachusetts Forestry Association, and the National Editorial Association, were noted.

The Director of the National Park Service covered a number of sections of the park-to-park highway as it could be designated in Oregon, Washington, and California, between Sequoia and Mount Rainier National Parks, and found most of them to be in reasonably good condition and available as links in the national park highway system. There are many sections of this proposed system so situated as to require no special designation, but again there are other near-by routes that might be selected. Designations have been made by the National Parks Highway Association with headquarters in Spokane, Wash., with particular emphasis on the sections between Yellowstone, Glacier, Mount Rainier, and Crater Lake National Parks. The Yellowstone Trail Association at Aberdeen, S. Dak., and the National Park-to-Park Highway Association, which has its headquarters at Cody, Wyo., have designated other routes.

When the idea of an interpark highway was first suggested it was conceived as a great circular route, combining the major national parks of the West, but beginning and ending in Denver, Colo. It may, however, be necessary to make a number of alternative routes in the system and a few of what might be termed small circle tours for the use of motorists. To complete the big tour in one season will be difficult. In this connection it will be of interest to mention a conference held in Yellowstone Park on August 10 and 11, at which 12 States were represented, for the purpose of discussing ways and means of expeditiously advancing the selection and improvement of the park-to-park highway and cooperating with the National Park Service in the encouragement of travel to the parks. This conference was organized as the National Parks Touring Association to secure the "cooperation and coordination of all State and National highway associations with a view to a composite road system leading to and connecting the national parks." This organization is practically completed. L. L. Newton, of Cody, Wyo., is general secretary of the association. The men who attended this conference have had a particularly broad experience with good-roads movements in the Western States and an intimate knowledge of the requirements of the situation.

States cooperating in road building.—Some of the States are cooperating with the park administration by providing highways to the park entrances. A particularly conspicuous example of this is found in California, where Tulare County has paved the highway to Three Rivers, the junction of the entrance roads to Sequoia Park; and the State has recently passed a $40,000,000 bond issue containing an item of $300,000 for completing the paving of the roads to the

park line. At Yosemite Park the construction of a paved highway from Merced to El Portal is being promoted by California business men. In Oregon the State and the Federal Government are constructing a highway that will later be paved from Medford to the west entrance of Crater Lake Park, some 72 miles. Washington is cooperating by issuance of bonds to pave the entrance roads to Mount Rainier Park, and Colorado is improving the entrance roads to Rocky Mountain National Park. Montana also is doing its share, with the cooperation of several counties, in improving the roads approaching the Yellowstone and Glacier Parks; and Wyoming is rebuilding two roads leading to the south entrance of the Yellowstone. These last two States are concentrating a large portion of their highway funds on these park approaches.

Park road construction a vital necessity.—Practically no money, however, has been available for road extensions in the national parks this year with the exception of a fund provided to complete the rebuilding of the El Portal Road in Yosemite. Work on the highways within the parks has been confined entirely to ordinary maintenance and repair. In some of the parks the funds available have not been sufficient even to prevent perceptible depreciation. An appropriation of approximately $1,000,000 a year for a period of years for extending the existing road systems of the parks is one of their most vital needs. The Government is cooperating with the States with an expenditure of millions of dollars in the building of highways, which includes at the same time a program for the development of roads through the national forests; the main scenic features of the parks should in a similar manner be placed available to the traveling public and the road systems within the parks should be developed and enlarged to accomplish this. Our motorists should at least find as good roads within the parks as they find in the approach roads to the parks which the States and counties furnish, particularly as the Government exacts an entrance fee from the automobile owners for using the park roads.

The need for paving roads is particularly pressing in Yellowstone, Yosemite, Crater Lake, and Mount Rainier. All one-way roads used for two-way travel should be widened to accommodate that double travel.

New road construction in prospect.—The National Park Service has a number of important new highway construction projects ready to be undertaken as soon as funds are provided. Surveys and estimates of cost have been made, and work can be started without delay. A transmountain road in Glacier Park to connect the east and west sides of the park is one of the most interesting, since it will connect the two sides of the park now practically separated from each other by the mountainous masses of the Continental Divide; unless a round-

about way is taken the east side of that park is isolated from the west side; only parts of this wonderful park area have been made accessible. Other projects of first importance are a road connecting the Yosemite Valley with Tenaya Lake on the Tioga Road—a road in Sequoia Park to connect the valley of the Middle Fork of the Kaweah River with the Giant Forest. At the Grand Canyon a road along the rim from El Tovar to Grand View is an immediate necessity, and the Carbon River Road along the river of that name to the mouth of the Carbon Glacier in Mount Rainier Park should be undertaken as soon as possible. In Rocky Mountain Park what is known as the Trail Ridge Y route demands recognition as an important road project. Other important road projects have been studied and planned and will be submitted for the information and action of Congress in due time. Perhaps the most important engineering project completed during the year was the construction of the new road in the Gardiner River Canyon, in the Yellowstone.

New trails.—Hand in hand with the development of roads goes the construction of new trails. Trail surveys and studies conducted by the engineering department included projects in the Grand Canyon Park and the Belly River district in Glacier Park. The allurements of the trails are strongest in the true lover of nature, and the construction of such leaders into the innermost recesses of our park wonderlands, where their glories may be enjoyed quietly and uninterruptedly, is an important part of national-park administration and development.

Accomplishments of the engineering and landscape engineering departments.—The advice these two sections are able to give in the development of the parks is of immeasurable value. In the manifold perplexing problems of road building, sanitation, construction, and water supply, the engineering department has proved its worth in the many problems covering the individual parks. The harmonizing of the necessary buildings, public and concessions, with the landscape; the correct location of all structures; the blending of design, whether buildings, bridges, or other structures, with each other and natural features of the landscape have been some of the problems that are being satisfactorily met by the landscape department. Many improvements in the location of camps have been planned, and in the construction of new hotels incidental to the tremendous demand for additional facilities, these departments are invaluable in their solution. The complex problem of a satisfactory and dignified method of marking the entrances to the park has, it is believed, also been solved by the development of plans of gateways that will be a credit to the parks. The activities of the landscape engineer go also into the details of forest improvement and vista thinning. The schemes for preserving stands of trees along highways, the clearing up of

brush and down timber along roadsides, and the elimination of dead timber in flooded lakes within parks are other problems constantly encountered in the development of the parks and falling within the landscape engineer's bailiwick. In all this work strict conservation is the guiding principle in order that the parks may be maintained in absolutely unimpaired form for the use of future generations, as well as those of our own time. The cordial cooperation evidenced by landscape men in private life who are prominent in their professions promises that the aim of this effort is true, and that the results in time will be eminently satisfactory to the most critical eye and mind.

The advent of aeroplanes in the national parks.—The feasibility of air service into Yosemite National Park was established when Lieut. J. S. Krull, flight commander at Mather Field, near Sacramento, Calif., piloted the first aeroplane into the valley on May 25, effecting a perfect landing after a flight started at Merced, Calif., and lasting 1 hour and 5 minutes. The first aeroplane to fly over Rocky Mountain National Park landed near the Stanley Hotel, at that park, a Curtiss biplane, piloted by Mr. I. B. Humphreys, being used. Although tentative proposals to operate air craft in various parks for passenger-transportation purposes have been made at various times, no definite complete proposition has been submitted. Aero transportation to, from, and between some of the parks may eventually be a popular feature in the development of tourist travel. Flying fields have already been suggested for Lafayette and the Grand Canyon National Parks.

The practicability of using aeroplanes for fire patrols over forested areas has already been proven, and arrangements for patrolling national park areas at regular intervals, particularly the Yosemite and Sequoia Parks, which are close to Mather Flying Field are contemplated.

Creation of Grand Canyon and Lafayette National Parks.—Efforts extending over a period of many years to make the Grand Canyon a national park had their culmination in the approval by the President on February 26, 1919, of the act establishing this park. This titanic example of erosion, with its area of 958 square miles, now covered into the park system, is the most sublime spectacle of its kind in the world, and it is truly a great satisfaction to have it perpetually reserved from private aggression for the enjoyment of our people. The nucleus of an administrative force has been installed, and work will quickly be gotten under way toward opening up this wonderland to the traveling public by rail and motor. The crying need of all this section of the country is good roads. Only 440 miles distant from Salt Lake City the north rim of the canyon, at present reached by a makeshift roadway and not developed to any degree of satisfac-

tion, has a great future. The south rim of this great abyss is better known to the visiting public, due to its greater accessibility to railroads. Curiously enough, in a land where the action of water was the chief element in the carving of this tremendous chasm and where rock is available in untold quantities, the problem of securing water and of getting suitable rock for roadways is a perplexing one. With the exception of small springs of slight capacity all water is beyond convenient reach in the bottom of the canyons and the rock is too soft for road construction. Both problems will, however, be solved.

The other event of the year of surpassing importance in park annals is the establishment of the first national park east of the Mississippi, namely, the Lafayette National Park, lying on the coast of Maine, near the city of Bar Harbor. This was formerly the Sieur de Monts National Monument. Its creation was the result of the efforts of a whole-souled, public-spirited body of men, of which President Emeritus Charles W. Eliot, of Harvard, and George B. Dorr, the present superintendent, were the prime movers. In addition to its unique distinction as the first national park in the East, it has the added attraction of being our first national park on the sea.

Area of parks and monuments.—The total area of the 18 national parks is now 10,739 square miles, or 6,872,960 acres, and the area of the 23 national monuments is 1,931 square miles, or 1,235,840 acres. There is one national park on the Hawaiian Islands and one in Alaska. There are two monuments in Alaska, which are under the jurisdiction of the National Park Service, and the others are in the States west of the Mississippi. Our national parks now cover an area greater than Massachusetts and Delaware combined.

Material for other national parks and monuments.—The national-park system is not yet complete. Several new national parks should be added, and there should be some important extension to a number of the existing parks. The following are examples: Sequoia National Park should be enlarged to include adjacent areas, and the name changed to Roosevelt National Park. The Teton Mountains and the grand scenic territory of the Jackson Hole region south of the present Yellowstone National Park should be added to that park. The Diamond Lake region, in Oregon, should be added to Crater Lake National Park; Mount Rainier National Park should take in Ohanapecosh Hot Springs. The Mount Evans region, in Colorado, is desirable for inclusion in Rocky Mountain National Park, and changes to round out and modify the boundaries of Yosemite National Park will undoubtedly be desirable. Glacier National Park should be extended to the park highway now traversing the Blackfeet Indian Reservation. Zion National Monument, in Utah, will undoubtedly receive national-park status during the coming year.

Bills giving the Bandelier Monument, in New Mexico, national-park status have already been introduced in Congress.

Other projects that have been mentioned for national park timber are the reservation of the Sand Dunes of Indiana, the Mammoth Cave of Kentucky, and the Great Oynx Cave not far distant from it. The Mammoth Cave is a worthy candidate for parkhood and the outright purchase of the cave is a desirable one. Furthermore, there should be a group of parks in the eastern section of the country which would include the best examples of the eastern landscapes and some of its most conspicuous natural features. Although not as rich in natural scenic wonders as the West, the East is entitled to recognition of the importance and value of the unique features of some of its areas by having placed upon them the stamp of superlative excellence which national park status conveys. While Congress has never adopted the policy of purchasing lands for park purposes, there is the precedent which authorized purchase of national forest lands in the Appalachian Mountains under the Weeks Act of March 1, 1911. Furthermore, no more noble gifts can be made to the Nation by public-spirited individuals than tracts of lands suitable for national parks and monuments. The East has already furnished its conspicuous example in the creation of its first national park.

Save the redwoods.—The necessity of saving some of the splendid redwood stands in California, which are fast being cut by commercial enterprise, demands prompt action. The Save the Redwoods League organized to stimulate interest in their preservation is doing splendid work. Bills to preserve a splendid forest of redwood trees of the species *Sequoia sempervirens* have already brought the necessity of quick action in saving these masterpieces of forest creation from the ax of the woodman direct to the attention of Congress.

Another outstanding feature in the preservation of some of our splendid scenic trees is the necessity of preserving strips of redwood and other timber along roads in building, or to be built, in various sections of the States of California, Oregon, and Washington. Nothing should be left undone to achieve this vital result. Even though short-sighted commercialism can not see the value of this, posterity's thanks will be inevitable for even the slightest effort made toward this end. Here is opportunity for cooperation of the most public-spirited sort.

Appropriations.—Due to war-time exigencies, appropriations for national parks, as in other lines of public endeavor, were cut to the bone. The appropriation for the fiscal year 1920 for the national parks and monuments, exclusive of the Hot Springs Reservation, which is self-supporting, amounted to only $754,195. Developing the

national parks to a standard commensurate with their dignity and importance to the Nation, and to meet the demands made upon them by an appreciative, enthusiastic people requires larger appropriations. The tremendous wear and tear which the roads and trails and other improvements suffered under the great influx of tourists requires ample funds for maintenance and repair. With increasing travel, or even with a future average yearly travel meeting this year's figures, the expansion and development of roads and trails and other facilities to relieve congestion by distribution of visitors must also have attention. Larger crowds mean larger administrative expenditures. In this connection it is of the utmost interest to know that the revenues derived from all of the parks and reservations during the past fiscal year amounted to $196,703.03.

Forest fires in the parks.—The past year has been particularly serious from the standpoint of forest fires. Glacier and Yellowstone National Parks suffered heavily, the demands of fire fighting at the height of the tourist season taking not only the services of men urgently needed for construction and maintenance work but funds for fighting these fires had to be taken from existing park appropriations, when they could ill be spared. Money was used that was badly needed to perform work that would benefit the traveling public, and which should have been done this season. The necessity for providing a general fire-fighting fund for the national parks to be available in any park in which fires happen to occur is obvious.

Yellowstone National Park.—Congress in granting to the National Park Service absolute control of this park's affairs made possible the great progress of this year. On the withdrawal of the military forces and abandonment of Fort Yellowstone the administration of the park was reorganized. Former Assistant Director Horace M. Albright, of the park service, was made superintendent in June, 1919.

All travel records of this park were broken, the visitors numbering over 62,000. The larger portion of these came in automobiles from every State in the Union. The result was that the hotels and camps became crowded, but the acute shortage of sleeping quarters became serious only in times of storms, when thousands of camping motorists sought shelter. Camp Roosevelt, at Tower Falls, will be greatly expanded, making four large hotels and five permanent camps available to the public next year. But these will have to be further extended to meet the growing tourist demands. Many tourists brought their own equipment and supplies during the greater part of the season, and it is estimated that from 5,000 to 6,000 people enjoyed motor trips over the road system each day. This means that extensive motor camps must be provided. Plans now prepared call for over 50 large camp grounds, reasonably near the park roads.

The elk herds are in danger because of drought injury to the winter range, and winter feeding grounds are necessary. The road system is in fine repair, but the tremendous increase in travel makes necessary extensive improvements, widening of certain sections, renewal and installation of bridges, culverts, etc. New telephone and telegraph lines are also needed for protecting the park from fires, the dispatch of public business, care of emergency calls, and accommodation of tourists. Ranger stations and snowshoe cabins are greatly needed; the former, built many years ago for housing of troop detachments, are now impossible, and the latter, used by patrolling rangers in the dead of winter, are worn out, poorly located, and detrimental to health.

Attention is again called to Mr. Mondell's bill (H. R. 1412) which would add part of the Jackson Hole country, including the Teton Mountains, to the park. Besides the reasons that have been advanced heretofore for adding this region, which belongs to the Federal Government, it would provide a southern entrance, which is much needed.

Foreseeing heavy tourist automobile travel, and realizing the possibilities of connecting Yellowstone and Glacier National Parks, the "Geysers to Glaciers Highway" was organized and promoted during the season just closed, by citizens of Montana. The entire State became enthusiastic in the work of road repair—in some towns all business houses closed while their owners worked on the highways. Another development of the season was the operation of an automobile passenger service between the parks via the "Geysers to Glaciers" route. Passengers were carried to Helena, where they were transferred to cars of the Glacier Park Transportation Co., and taken northward. To care for this new volume of travel Helena is planning the erection of an enormous resort hotel. Train service between Yellowstone and Glacier was also heavy, enough so to warrant the establishment of through sleeping-car service between these two parks. The Yellowstone-Glacier Bee Line Highway will be open next season, and will be popular, both because it is a short route and a scenic one.

Glacier National Park.—Notwithstanding drought and forest fires in this park visitors increased 108 per cent. The small crew of workmen employed for protection and improvement of the park had to be diverted to the fighting of the fires, and essential park funds had to be used for this purpose.

There is a growing tendency for visitors to spend longer vacations at the hotels and chalets, and on camping trips. All this created a demand for saddle horses which at times made an acute shortage. Tourists are becoming increasingly desirous of seeing the northern valleys of the park, and both horse and walking trails are much needed. A definite road construction program is ready as

soon as money is appropriated for this purpose. Montana has continued to give some aid in the maintenance of the road up to the North Fork of Flathead River.

While visiting the park this summer members of the Brooklyn Eagle party subscribed over $1,100 for the improvement and repair of the road between Babb and the Canadian line, in order to give our park system a connection with the highways of Alberta. The people of Montana and Alberta have called this highway "The Brooklyn Eagle Trail."

A new telephone system is needed as a fire protection and aid to administration of the park and transaction of business with the hotels and transportation lines. The irrigation works are now in operation, and the expected havoc has taken place.

The wild animals are flourishing since the predatory kind have been reduced, and fishing is becoming better each year.

Yosemite National Park.—Travel to this park began earlier than usual, and the volume was sustained to the end of the summer season, making a new record for itself. The realization by the public that Yosemite Park possesses more attractions than just those of the great valley came faster than the administration and business interests expected, so that facilities for accommodating the crowds were severely taxed. Fully half of these visitors were cared for in the great automobile camps, which are a very popular feature of the park.

Emergency improvements were necessary this year, but a new building program must be put in operation. The Yosemite National Park Co., composed of business men of San Francisco and Los Angeles, contemplates immediate improvements to the extent of $300,000, and it estimates that to care for the travel that is certain to come to Yosemite National Park next year, improvements should be made aggregating $1,500,000. This includes the building of a new hotel and camp on the floor of the valley, further improvements in the sanitation system, and water supply of Glacier Point hotel, and building of a camp on the Tuolumne Meadows. The lunch camp in Mariposa Grove has proven a great accommodation.

The completion by the State highway commission of a paved road to the gates of the park, promoted by California business men, will when it is completed, make it necessary for the Government to pave the new El Portal Highway and the road system of the valley floor. The proposed Yosemite Valley-Nevada Falls-Tenaya Road must be built, in order to give quick access to the Sierra section of the park and relieve traffic congestion on the floor of Yosemite Valley. It will cost approximately $500,000 and take several years to complete. As soon as the new all-year road is completed, the winter sports of this park, now enjoyed in a limited way, will become increasingly popular. Half Dome is now scalable; the Sierra Club contributed

a protection for the trail to its top, consisting of a row of iron posts set in the rock, and through which stretches a double cable. A trails development plan is now being worked out with the assistance of the Sierra Club.

Fishing has been excellent, and the State fish and game commission is prepared to build the new hatchery as soon as authority is obtained. The importance of game preserves on the western boundary is again mentioned, as the deer, which are plentiful, need better protection. California has ceded to the Federal Government the protection of the fish and wild animals of the park, to take effect when Congress accepts this tender.

Important cooperative work was performed by the United States Public Health Service in combating the mosquito evil in Yosemite Valley, and making a survey of the sanitation needs of the park. The result of this survey indicates the entire sanitation system of the valley must be rebuilt immediately.

Among the signs of progress is the educational use of the park. This year the Le Conte Memorial lectures were delivered under the direction of the extension division of the University of California; they are to be a park institution, to continue indefinitely. Animal life is also being studied under the direction of Dr. J. Grinnell of the Department of Zoology. To make a detailed survey of Yosemite Valley, the Geological Survey has detailed a topographic engineer, and the Bureau of Entomology has continued to give extensive assistance in controlling insect pests that are attacking the forests in certain parts of the park.

Sequoia National Park.—Proposed legislation to add to this park about 1,300 square miles of scenic area and to change its name to Roosevelt National Park has made the public familiar with this Greater Sequoia project. The suggestion to rename this park in memory of the late former President came from a member of the Boone and Crockett Club, of which Mr. Roosevelt was the founder. The future of this park depends so much on the outcome of the enlargement project that development work is being retarded. The public camps present a problem as to control, sanitation, and water supply. Two new road approaches are borne in mind—one from a point on the Middle Fork of Kaweah River near Hospital Rock to the Giant Forest road system, and the continuation of the road between Sequoia and General Grant National Parks. The first approach road would require approximately two years to construct. Automobile transportation service to the park will be better and more extensive next season.

The destruction of trees all along the Pacific coast and highways of the northern part of the State emphasizes the value of the recent purchase of the Giant Forest by the combined action of Congress

and the National Geographic Society, thus preserving it from the fate of the related forests of the north.

General Grant National Park.—This park, which is steadily growing in popularity, may be one of the main gateways if not the principal entrance to the Roosevelt National Park when this reservation is established. The private lands of a lumber company, on which there are several large stands of sequoia trees and which have been offered to the Government, include the gift of Sequoia Lake, which adjoins General Grant National Park. The 160 acres of privately-owned land within the borders of this park should be acquired by the Government at the value of the property and improvements.

Mount Rainier National Park.—Travel to this park exceeded that of 1918 by 25 per cent, there being 55,232 visitors. This park was a particular attraction to eastern tourists. Hotels and camps were filled to capacity and the week-end congestion of former years was augmented. Paradise Valley was the favorite headquarters for tourists, and extensive housing facilities will be added there to meet such demands for years to come. Anticipating the Labor Day crowds 500 Army blankets were procured from Camp Lewis by permission from the Secretary of War, enabling the park administration to meet this unusual demand. This is an example of the fruits of cooperation between Government departments in the interest of the people. The guide service was particularly successful in contributing much to the enjoyment, enthusiasm, health, and protection of the tourists. Seven large conventions were held in the park during the season, besides which several mountain-climbing clubs pursued their sport there.

The deer are not flourishing because they are not protected in their feeding grounds. A State or county game preserve should be established. An extensive biological survey is now in progress, publication of the results of which will add to the natural history series of the National Park Service. The Longmire property, an eyesore for many years, has been leased by the company now owning the other hotels of the park. The Carbon River region should be opened up next, to relieve the congestion of travel, and after this has been done a hotel will be erected by the concessioners.

A broad scheme of road development has been worked out, which should be executed as promptly as possible. The White River Road should be improved, the Carbon River Road completed to the Glacier, the Carbon and Nisqually Roads connected, and the road between Glacier Basin and the Carbon River completed. The only trail built during the year ascends Klapache Ridge north of St. Andrews Creek and continuing to St. Andrews Park. Mount Rainier National Park should be extended to take in Ohanapecosh Hot Springs, which

would add only a narrow strip to the park, but would mean much for the benefit of the public.

Crater Lake National Park.—The outstanding features of the past year in this park are the completion, after several years' work, of the road around the rim of the lake, and the transfer of the engineering projects from the control of the Corps of the Engineers of the Army. This transfer will permit of future progress in all the parks in accordance with a uniform policy. Trails were built this year from the Rim Road to Sun Notch and Crater Peak. Because of the character of the natural surfaces the maintaining of good roads has been difficult. Experience, however, has taught that an oil-bound macadam road much more satisfactorily withstands travel demands than does water-bound macadam. If Crater Lake National Park is to be developed as a resort for motorists, approach roads must be rebuilt or repaired. State and Federal aid funds are now available and this improvement should be rushed to completion.

The hotel service at Crater Lake Lodge was better than last year. In August nearly 400 members of the National Editorial Association arrived in the park, taxing the hotel's facilities beyond its capacity. However, the chambers of commerce of Ashland and Medford, together with the park superintendent, contributed tents and blankets, making the excursionists fairly comfortable for the one night they spent in the park.

Senator McNary, of Oregon, has introduced a bill providing for the addition of the Diamond Lake section to Crater Lake National Park. A road connecting the Diamond Lake country with the Rim Road would be a simple matter, and with the aid of State and county authorities, from a point south of Crescent on the Central Oregon Highway, a new entrance into this park could be developed. Camping facilities around Diamond Lake are excellent.

Mesa Verde National Park.—Some permanent improvements have been completed, the most important being the new road ascending the Mesa Verde from the east side of Point Lookout. There are still wonderful sections of the park which are inaccessible. Two new highway routes—one following the higher or north rim of the Mesa and the other running south from Spruce Tree Camp, connecting with the Cortez-Shiprock Highway—would open up exhibits of ancient architecture.

Archæological work which for lack of funds had to be abandoned in 1916 was resumed this year, Congress having appropriated sufficient money to undertake the repair of Square Tower (Peabody) House, which has been in danger of collapse. Dr. J. Walter Fewkes, Chief of the Bureau of Ethnology, is engaged in restoring this structure to a state of security. Excavations of the ruins in this park should be continued systematically, in the interests of the traveling

public and the science of archæology and related sciences, thus attracting students from all parts of the world. A few miles west of the park, on the edge of Montezuma Valley, are the Aztec Springs ruins, which have been deeded by Mr. Henry Van Kleeck, of Denver, to the Federal Government for a national monument. As the name Aztec is a misnomer and often confused with the ruin near Aztec, Mexico, it has been proposed to call this monument Yucca House National Monument. The Yucca plant grows abundantly there, and the name is commonly used by the Indians.

Grand Canyon National Park.—It is interesting to know that the first bill to make the Grand Canyon a national park was introduced June 5, 1885, by Senator Benjamin Harrison, of Indiana. The Grand Canyon has been a national monument since 1908 and has been administered by the Forest Service of the Department of Agriculture. By act approved February 26, 1919, this wonderful area was elevated to national-park status under the Department of the Interior. As there was no field organization ready, the administration of this park was not taken over by the National Park Service until August 15, when an acting superintendent was appointed. A ranger force was speedily established and the organization is now in full working trim.

The imperative needs of the park are roads and the development of a comprehensive trail system. Chalets and camps should be constructed on the north rim of the canyon and other places, as well as on the south rim. Automobile tourists are increasing in numbers, and suitable camp sites, including garage and repair-shop facilities and tourist supplies, will be laid out and developed as quickly as possible. One of the problems is the securing of water which, on the south, rim, is at present brought in by railroad from Del Rio, about 125 miles distant.

The park area is particularly rich in archeological and prehistoric material, valuable from a scientific standpoint, but is as yet for the most part unexplored.

Travel to the park this year indicated that even with its present facilities its attractions are irresistible and, with the intensive development of the park for the use of the public it will increase by leaps and bounds.

Rocky Mountain National Park.—In 1917 and 1918 Rocky Mountain National Park held the record for tourist travel to the big scenic parks of the West, but this season it takes first place in the entire park system as a tourist resort, passing Hot Springs by 9,000 and reaching a total of 169,492. All of the hotels were incapable of meeting the public demand. With the cooperation of hotels outside of the park adequate accommodations might be provided if guests would stay two or three days, but they came to spend a long time in

the park. Accommodations in and near the park were reserved for the remainder of the season very shortly after they opened. As winter sports are also enjoyed there, it seems destined to become an all-the-year-round park.

The limit of annual appropriations to $10,000, in force until now, has prevented proper protection to its natural features from fire and other destructive agencies. Legislation repealing this inhibition is, therefore, the most important event of the year in this park, not excepting the gratifying increase in its travel. Larger developments are now possible. Game must be protected in both summer and winter; a machine shop, a stable, a storehouse, and a garage must be erected and equipped; and road, trail, and other machinery and tools be procured. Existing roads must be improved; also numerous trails and several important links in the telephone system. Work on the transmountain road connecting Estes Park and Grand Lake, known as the Fall River Road, is being pushed by the State and will be completed by July, 1920, if labor conditions and weather permit. Outside of the park the State of Colorado is expending large sums of money improving the Big Thompson and South St. Vrain approach roads.

A bill providing for the addition of the Mount Evans region to Rocky Mountain Park was introduced during the last session of Congress. This proposed addition covers 160 square miles, abounds in animal life and has a wide range of plant life. Commercially it is worthless, aside from certain grazing lands which are now, and always should be, preserved as a range for game. Denver is extending its road system to Mount Evans, and has agreed to acquire all the private holdings in the park region necessary for administration and improvement purposes.

Mount McKinley National Park.—Although Mount McKinley National Park was established in February, 1917, as an emergency step in the preservation of the great herds of wild animals of that region, Congress has not yet provided any funds for carrying out the provisions of the organic act. The small appropriation allowed the Territorial government for game protection of the entire area of Alaska does not permit of care of the park. As a game preserve it is almost comparable with Yellowstone National Park, and is in much more danger of the hunter because of its distance from civilization. It is not the policy of the National Park Service to immediately open this park to tourists, the preservation of its animals being of first importance. With the work on the Alaska railroad resumed and soon to reach the vicinity of the park, the menace of unprotection grows more threatening.

Lafayette National Park, Me.—This, the first national park in the East, was until February 26, 1919, administered as the Sieur de

Monts National Monument. These 5,000 acres upon Mount Desert Island were first acquired through the efforts of President Emeritus Charles W. Eliot, of Harvard; George B. Dorr, of Boston; and others, and in 1913 offered to the Government. Additional land has been given to increase the area to about 10,000 acres. It has varied natural attractions, besides its location on the ocean front, and is easily reached by rail or motor.

Mr. Henry Lane Eno, ornithologist of Princeton University, has been placed in charge of the bird life, and Mr. Edward L. Rand, of Boston, secretary of the New England Botanical Society, of the plant life. Mr. Charles W. Johnson, curator of the Boston Natural History Museum, and an entomologist of note, is studying the insect life. These men serve for a nominal compensation.

The congressional appropriation of $10,000 is being used for protection of its wild life, maintenance of old trails, development of new ones, minor improvements, and surveys for future development. During the coming year ranger camps will have to be established for protection of the wild life, discovery of forest fires, and guidance of visitors. In the season just closed 64,000 visitors came to the park.

Platt National Park.—Lack of funds has prevented more than the bare maintenance of existing improvements in this park. As Antelope and Buffalo Springs became suddenly dry in January, 1918, and have not resumed their flow, the sinking of wells has become necessary. Citizens of Oklahoma have subscribed funds for transporting elk from Yellowstone National Park and buffalo from Niobrara Reserve, and as there are a few deer, numerous smaller mammals and birds, this park has possibilities as a game preserve.

Sullys Hill Park.—This game preserve has been maintained by the Biological Survey since 1915. This year Congress made an additional appropriation of $5,000 for improvements necessary for the protection of the game and comfort of visitors. A proposed Sunset Highway along Devils Lake and running through the entire park would stimulate travel there.

Wind Cave National Park.—A tremendous increase in travel marked the year's activities at this park, improved transportation facilities and proximity to transcontinental highways being largely contributable. The park has been well maintained; the game preserve therein, which was established in 1912, has 4,160 acres under fence and is prosperous.

Hot Springs Reservation.—The Government had no building site at Hot Springs that seemed suitable from the standpoint of convenience and economy for the free bathhouse and new administration building, funds for which had been appropriated by Congress—$140,000 from the Treasury and $50,000 from the revenue fund.

When a location was discovered that would meet requirements the citizens of Hot Springs purchased the site (block 82), and title to the same is expected to be transferred to the United States as soon as legal processes will permit. The building fund has been reappropriated by Congress and made available for the fiscal year 1920.

Instead of a new administration building, the present structure will be remodeled to harmonize with the other buildings. Three new bathhouses will also be erected on the reservation front to replace the present Magnesia, Ozark, and Lamar bathhouses, ordered to be demolished at the end of this season. These will be built at the expense of the lessees.

Caring for the indigent people who come to Hot Springs for treatment is still an important housing problem. The citizens of the city have rendered a national service in assisting this class of visitors; but this call of humanity should also have a national response.

This park is growing rapidly in popularity, over 160,000 persons having visited it in the course of the year. The number of paid baths was 729,997, an increase of 25,022 over 1918. Total receipts for 1919 were $346,974.46, a gain of $14,183.34 over 1918. Net profits, however, decreased somewhat, due to the greatly increased cost of operation. The 1919 season profits were $127,476, while for 1918 they were $127,911. The Government free bathhouse supplied 87,040 baths, the Leo N. Levi Memorial Hospital, 5,445. Altogether there were 824,326 baths taken at the reservation during the season, an increase of 21,501 over last year.

Spring flowers approximating 15,000 bulbs were planted last December in certain sections of the reservation under the supervision of a landscape architect and afforded pleasure to the winter visitors. The effort made during the consideration of the last sundry civil bill to change the name of this reservation from Hot Springs Reservation to Hot Springs National Park was unsuccessful, but another effort will be made to present the merits of the proposal to Congress.

Lassen Volcanic National Park.—Although made a national park by Congress in 1916, this area is still administered by the Department of Agriculture, no funds having been provided for the National Park Service to assume control. A certain amount of grazing has been permitted, which has been entirely in the hands of the forest rangers. An office should be established and existing improvements maintained and others arranged for, unless it is the intention of Congress to no longer consider it as a part of the national park system, in which case it should be withdrawn and made a national monument. It has been suggested that in the park-to-park highway plans a fascinating tour could be made from Crater Lake National Park to Yosemite National Park by way of Klamath Falls, the lava beds, Lassen Volcanic National Park and Lake Tahoe. During the past

two years Lassen Peak has been quiescent, the last eruption observed being that of December 3, 1917.

Hawaii National Park.—Although no funds for the administration of this park have been available, the small appropriation made by Congress for inspection and continued negotiations for acquisition of private lands were effectively utilized, the Director of the National Park Service making a personal investigation of the park last spring. All lands on the west side of Kilauea Crater belong to the Government, but are wholly unfit for development as camp or hotel sites because of the noxious fumes. The lands not affected by these fumes are held in private ownership and are the areas necessary for park purposes. Before any appropriations for the improvement of Hawaii National Park can be made the private holdings necessary for the administration and operation of the park must be secured, together with the rights of way for roads and trails. An inhibition in the organic act establishes this situation. All private holdings in the Mauna Loa Park area have been acquired, and at the first opportunity the survey of a road to connect the Kilauea area with the summit of Mauna Loa will be undertaken. The Maui Chamber of Commerce has built a comfortable concrete rest house in the Haleakala Park area. The volcano of Kilauea has been quite active during the year.

Zion National Monument.—This monument is proposed as a national park, and as soon as this is accomplished certain extensive improvements should be made. Utah has continued its work of constructing permanent improvements on the highways leading to the monument, and if the suggestion to develop Arrowhead Trail from Salt Lake City to St. George is carried out, travel to Zion National Monument will increase greatly. Figures show that more people visited the monument this year by motor than by rail. Prehistoric dwellings have been discovered during the past summer, located only 4 or 5 miles from the entrance to Zion Canyon.

Muir Woods National Monument.—A water system which includes a reservoir has been installed. Mr. William Kent, who in 1908 donated to the Federal Government this tract, is now arranging to convey to the Government another tract of beautiful forest land, for the purpose of enlarging this monument. This tract will include Steep Ravine, which is not far from the Pacific Ocean. In event it is decided to exclude automobiles from these woods it will be necessary to construct an adequate parking space immediately below the reservation, which the owner has tendered for use as a parking area. This arrangement will offer increased advantages as a camping and picnic ground to visitors. Trails, both for use of visitors and as fire-patrol routes, are needed, also a cottage for the custodian.

Chaco Canyon National Monument.—Excavation and restoration of some of the ruins of this monument are being undertaken by the Smithsonian Institution, the School of American Research, and the Royal Ontario Museum of the University of Ontario. A permit has been granted to Dr. Clark Wissler, of the American Museum of Natural History to conduct archaeological investigations at the Pueblo Bonito. The building of the dam and other work necessary to restore the ancient but comprehensive irrigation system will be done by the National Park Service.

Gran Quivira National Monument.—A proposal has been made to extend this monument to include the adjoining tract with the School of American Research purchased from private holders for purposes of preservation and scientific study. Some excavations are in progress by the School of American Research.

Petrified Forest National Monument.—Situated near both a transcontinental railroad and an automobile highway, this monument was visited this year by a large number of travelers. The improvement and repair of a section of the highway through one of the principal forests was the chief work done during the year. Besides the maintaining of good roads, a bridge is needed over the Rio Puerco between Adamana, the railroad station of the monument, and the north line of the reservation. A ranger is needed to prevent depredations.

El Morro National Monument.—The problem connected with this monument is the protection of the historic inscriptions from vandalism. Due to the work done on the Grand-Inscription Rock Road, the State of New Mexico is improving the Ramah-Gallup Road. The marking of trails, placing of warning signs, and opening up of the spring at the base of the rock for visitors, are other improvements borne in mind for early attention. Improvement of roads is bound to bring larger numbers of visitors.

Tumacacori National Monument.—Although established in 1908, not until this year were funds available for repairs on the old mission building. Mr. Frank Pinkley, custodian of the Casa Grande National Monument, who was last year made custodian also of Tumacacori National Monument, without additional compensation, directed numerous repairs on the structure. In this work Mr. Pinkley was assisted by the Chambers of Commerce of Nogales and Tucson, Ariz., and the archaeological department of the University of Arizona, the latter headed by Prof. Byron S. Cummings. These institutions also subscribed funds for a portion of the restoration work.

Dinosaur National Monument.—Continued investigations and excavations of this monument are being carried on by Dr. W. J. Holland, of Carnegie Institute of Pittsburgh.

Casa Grande National Monument.—Considerable important but inexpensive improvement work was accomplished here during the

past year, namely, the clearing of débris and growth of brush, the building of a well, and the providing of picnic grounds, and parking areas for automobiles. The archaeological work undertaken consisted of preparation for investigations of these buried ruins. The study of an elliptical mound leads to the conclusion that the building within was used as a stadium by the ancient inhabitants of the village.

Navajo National Monument.—Work of repairing Betatakin (Hillside House), a remarkable example of cliff dwelling, was completed last year, under the management of Neil M. Judd, of the National Museum, as field officer. These ruins are to Arizona what the ancient villages of Mesa Verde are to Colorado; and, like the latter, will continue to draw an increasing number of visitors each year. The task of restoring these historic ruins is not difficult, and is a matter of great importance.

Montezuma Castle National Monument.—This monument is in poor condition, and repairs should be undertaken to prevent further deterioration. A resident custodian is needed, but only a nominal sum is available for his services. There is considerable public interest in this monument.

Katmai National Monument, Alaska.—The four expeditions of the National Geographic Society to this region in 1918, which were followed this year by the largest exploring party yet sent out by this society to the region of Mount Katmai and the neighboring valley of Ten Thousand Smokes, more than justifies the creation of this natural wonder area into a national monument. The scientific harvest was unexpectedly large; and, as thousands of feet of film were brought back, the public will have an opportunity to become acquainted with the scenic wonders of this unique region. The discovery of an abundance of fish and game increases the qualifications of this monument as a national park of the future.

Devils Tower National Monument.—The road leading through the monument to the base of the tower was repaired, and the spring at the base of the monument developed to provide drinking water for campers and tourists visiting this natural curiosity.

Lewis and Clark Cavern National Monument.—Because of its inaccessibility it was thought best not to open this cave to the public until it has been made easier of approach and funds have been made available to compensate a resident custodian. This is necessary to prevent depredation. It is under the supervision of the superintendent of Yellowstone National Park.

Shoshone Cavern National Monument.—The trail to Forst's Cave in this monument was finished and offered numerous tourists an opportunity to visit this cavern. Its attractions will furnish an interesting side trip from Cody or the eastern approach to Yellowstone Park.

Sitka National Monument.—Of great interest to Alaskans was the repair of the 18 totem poles on the monument. The highest of these is 60 feet. In addition, seats were placed at prominent points on the island commanding good views of the particularly numerous scenic attractions of the neighborhood. The monument is located only 1 mile from Sitka.

Other national monuments.—Nothing of particular note has transpired in or near these areas; they either do not require extensive improvement or are not susceptible of development except at great expense. These reservations are the Pinnacles National Monument, California; Natural Bridges and Rainbow Bridge National Monuments, Utah; Colorado National Monument, Colorado; Papago Saguaro National Monument, Arizona; Capulin Mountain National Monument, New Mexico; and Verendrye National Monument, North Dakota.

THE TERRITORIES.

Since the transfer under Executive order of July 15, 1909, of the supervision of affairs in Porto Rico to the Insular Bureau of the War Department, the former Territories of New Mexico and Arizona have been admitted as States, and there now remains under this department the supervision of but two Territories—Alaska and Hawaii.

ALASKA.

In the report of the governor for the fiscal year ended June 30, 1919, a strong plea is made for the withdrawal of governmental restrictions on development and for assistance in opening up the Territory to more extended commercial activity. The governor expresses the appreciation of the Territory for what has been done heretofore, but urges still greater assistance so that Alaska can be placed on a greater revenue producing basis. In particular, he draws attention to the lack of Territorial police protection, the closing of industries due to high freight rates and the inadequacy of appropriations.

During the year the Territory has suffered from flood, fire, famine, sickness, and death. Floods have caused great destruction in Seward, Juneau, and Nenana; fire has wiped out a large part of the business section of Fairbanks and, due to the epidemic of influenza, a large proportion of the native population of the Seward Peninsula received relief through Territorial agencies.

The most serious of these disasters has been the scourge of influenza. Following the lines of steamer travel, early in October, influenza broke out in practically all the coastal towns. Travel to the interior was stopped and so escaped an outbreak there. Had the epidemic reached the native and white settlements of the Yukon, the

mortality would have undoubtedly been high, as pneumonia is very fatal in the intense cold.

It is estimated by the assistant commissioner of health for the second division and the officials of the bureau of education that there have been 1,500 deaths, chiefly among the natives on the Seward Peninsula and vicinity. Particularly in Nome and on the peninsula was the epidemic most severe. Whole villages of Eskimos lost their entire adult population. The bureau of education, in charge of the natives of Alaska, was powerless to render much assistance on account of a lack of funds. The governor was asked to take charge of the situation. Medical relief was given where possible, destitution was relieved, and the orphan children gathered up and placed in institutions until appropriations should become available for their permanent care. The Public Health Service rendered aid to a limited extent in the matter of employing physicians and nurses. After the worst of the epidemic was over the American Red Cross lent some financial assistance and sent nurses and physicians north on the naval collier *Brutus*. The bulk of the authorizations, however, were unprovided for. The burial of dead natives alone cost approximately $20,000. A bill was introduced in the Senate appropriating $100,000 for Alaskan relief and passed that body but failed in the House. Items attached to the sundry civil and deficiency bills also failed of passage in the House. As a last resort, the governor appealed to the Territorial legislature and received an appropriation from its treasury of $70,000 for the relief of the native wards of the Federal Government and $23,000 for whites—this in addition to some $18,000 or $20,000 already expended from various other Territorial funds.

Two hundred and thirty-eight orphans, so far reported, are practically all that are left of an Aleut and half-bred population of between 800 and 1,000.

Consolidation of governmental authority.—Attention is drawn to the great confusion existing in Alaska over conflicting departmental authority. There are as many as five different organizations building and maintaining roads on small appropriations; fish canneries must deal with three different departments; game animals are under the jurisdiction of the Department of Agriculture, while fur-bearing animals are under the Department of Commerce; and the settler on forest reserves is always faced with delay on account of the dual authority of the Department of Agriculture and the Department of the Interior. Birch wood, needed in the manufacture of furniture, may be exported from forests, but not from public lands, where the best stands are found. There are reservations and withdrawals administered by no less than seven executive departments. The governor advocates the centralization of all possible authority in the Department of the Interior and then the further centralization of all

bureau authority in Alaska itself, thus making an effective government, responsible to but one chief. There could be then but one territorial budget and one overhead administrative organization.

Police protection.—The great need of the Territory is police protection; there are 4 United States marshals and 55 deputies, including the office deputies. The marshals are technically process-servers and a preventive force. There are 30 or 35 wardens of various bureaus. The governor recommends that all police power be consolidated in the establishment of a uniformed constabulary, patterned after the Pennsylvania Constabulary or the Royal Northwest Mounted Police of Canada. The officers should be given the powers of justices of the peace. Two hundred men of a constabulary scattered throughout the Territory, with travel equipment suited to their particular locality, could perform all needed police work. They would be available not only for police duty, but as quarantine officers in case of epidemic and for rescue service. At present there is a battalion of troops in Alaska, which could be withdrawn and a constabulary substituted therefor.

Naval patrol.—On account of the beneficial results of the former naval patrol, the governor requested that it be continued throughout the year 1919. The gunboat *Vicksburg* and the submarine chasers were returned to Alaskan waters in May and have been most energetic in their activities. The *Vicksburg* rendered splendid service in the Aleutian Islands and in the vicinity of Bristol Bay during the outbreak of influenza in May and June of this year. The *310*, stationed in Prince William Sound, quieted what bid fair to be a serious disturbance between the white and native fishermen at Yakutat, and the *309* has rendered similar service at Klawock. At present the patrol is taking active steps to suppress fish piracy, which has been engaged in more than ever before.

There should constantly be stationed at Juneau a naval or Coast Guard vessel, available for rescue work in case of shipwreck and for cooperation at all times with the Federal and Territorial authorities; during the summer season there should be at least four of the smaller craft on constant duty. So far the results have been invaluable, particularly in the absence of other police power.

Population.—During 1918 the population of Alaska reached its lowest ebb. Vessels reporting to the customs showed an excess of departures over arrivals of 9,909 persons. At the close of the calendar year 1918, taking the customs-house figures into consideration with the census of 1910 and the vital statistics available, the white population barely exceeded 30,000. The governor believes that during the years of exodus (1916, 1917, 1918) fully 10,000 additional people left on small craft, Government ships, transports, and other unreported boats, so that the actual population probably did not ex-

ceed 20,000. The number of persons voting at the election of 1918 seems to bear out this hypothesis. For the first six months of 1919 the excess of arrivals over departures, as reported to the customs, was 11,588, but this figure includes a great number of cannery employees, perhaps five or six thousand, who return to the States at the close of the fishing season. The governor estimates the white population at the end of the fiscal year 1919 to have been about 32,000.

Mineral production.—The value of the mineral output of the Territory in 1918 is estimated at $28,253,961, a decrease of almost $12,500,000 from the value in 1917 and the smallest since 1914. The decrease was chiefly in copper and gold and was due to a shortage of labor and ships and high cost of mining. There was an increase of more than 60 per cent in the production of mineral fuels and a slight increase in chrome ore; the only new item among mineral products in 1918 is palladium. Since 1880 Alaska has produced gold, silver, copper, and other minerals worth more than $418,000,000.

Alaska mines produced gold to the value of about $9,480,952 in 1918, compared with $14,650,000 in 1917. The total value of the gold mined in the Territory is now about $302,000,000, of which $213,000,000 has been from placers. In 1918 about 69,224,951 pounds of copper was produced, valued at $17,098,563. The production in 1917 was 88,793,000 pounds, valued at $24,240,000. The total copper produced to date is 497,786,565 pounds, valued at $105,743,033. The value of lesser mineral products in 1918 was as follows: Silver, $847,789; coal, $411,850; tin, $118,000; lead, $88,088; miscellaneous metallic products, including chrome ore, tungsten, palladium, platinum, and antimony, $96,100; and miscellaneous nonmetallic products, including petroleum, marble, gypsum, and lime, $120,619.

The governor draws attention to the fact that mining in Alaska has never before been conducted under such adverse conditions. The gold placers, heretofore the backbone of the industry, are the principal sufferers. Wages, costs of equipment and supplies, high rates of transportation, shortage of labor, together with the depletion of the known rich deposits, have all conspired to reduce not only the production of placer gold, but have also prevented contemplated development of the lower grade deposits. For similar reasons, the great low-grade lode mines of the Gastineau Channel have not been able to operate at any marked profit, although all modern devices for reducing costs are being employed.

Copper.—Owing to the lack of transportation during 1918 and governmental demands during the war for the higher grade copper ores, practically none of the low-grade copper mines were enabled to continue normal shipments, to the great distress of the operators.

During the first six months of 1919 the low price of copper was another deterrent feature.

Coal.—In the matter of coal, once more transportation becomes a prime factor. There must be an export outlet; it is probable that trans-Pacific coal-burning ships will find it advantageous to establish a coal supply in the Aleutian Islands not far from the "Great Circle" sailing routes between Puget Sound ports and the Orient. A naval base in Alaska will demand coal in quantity, which can best be supplied from our coal fields. The opening up of the coal fields and their connection with rail and water transportation will eventually result in the building of a smelter on Prince William Sound whereat all the ores of the district can be reduced. When this happens, many of the lower grade mines, not now workable to profit, will become active producers.

Petroleum.—It seems probable that Congress will enact laws at this session which will permit the development of oil fields which are known to be of value. Under existing law, all oil fields are withdrawn from either entry or lease. It is noted that the oil production and consumption curves have crossed and, if for no other reason than to help reduce the exorbitant prices now paid for oils, every encouragement should be held out to the developers of the fields.

United States Geological Survey.—A suboffice of the United States Geological Survey was opened at Anchorage on July 1, 1918. Its function is to maintain headquarters throughout the year for a resident geologist to work on special problems connected with the mining industry of the region and also to serve as a center from which to distribute survey publications and maps and to collect mineral statistics. The establishment of this office marks the further endeavor of the department to assist in the industrial development of the Territory and should become an important factor in the expansion of mining, more particularly along the lines of the Government railroad.

The Alaska Experiment Station of the United States Bureau of Mines at Fairbanks is one of ten similar stations conducted by the bureau throughout the country, the others being located in different mining States. The object of the station is to render every possible assistance to prospectors, miners, and operators; to conduct experiments and disseminate information with a view to increasing efficiency, preventing waste and safeguarding working conditions in mining. The establishment of the station will result in undoubted good to the Territory and is appreciated.

Fisheries and fur-bearing animals.—The fishing industry has now become probably the most important industry of coastal Alaska. Canneries, salteries, cold storage plants are springing up on every hand, but it is feared that the enormous catches of late years will

soon result in a noticeable depletion of the fisheries. There have always been lean years and fat years, but the lean years are becoming more lean and the fat years not so fat. Attention has been brought by those not particularly interested in the conservation of our sea resources to the fact that more and more fish are being yearly exported, but they do not draw attention at the same time to the greater number of fishing devices, the larger and more numerous craft engaged in the trade, the deadly floating trap and the practically uncontrolled stream fishing. 1918 was a banner export year.

The salmon pack for 1919 will probably not exceed 50 per cent of that of 1918. Streams which a few years ago teemed with spawning salmon, now appear almost barren.

The governor favors the transfer of the entire conduct of the fisheries to the Territory, so that governing laws may be enacted by men familiar with local conditions. The money available for the work of the Bureau of Fisheries is so inadequate to the purpose that even the limited number of boats and men employed can not operate throughout the entire season. As a consequence, laws and regulations supposed to control almost every operation are continually being violated by both cannery men and independent fishermen.

If the transfer of the fisheries to the Territory can not be effected, the governor advocates a most liberal appropriation for the protection of Alaska's fisheries and this can be done without loss to the Government, as the revenue derived by the Federal Government from the sale of seal and fox from the Pribilof Islands, from confiscated beaver and marten skins, from by-products of the seal rookeries, are many times in excess of all moneys spent on the fisheries in Alaska, and as additional protection is afforded, so will additional revenues be collected.

Starting with the month of June, the robbing of fish traps and the intimidation of watchmen constituted a menace to cannery operations. Apparently a well organized conspiracy existed for the illicit brailing of traps and for the disposal of the plunder. It was estimated that at least twenty boats were engaged in the unlawful practice. After considerable delay, during which time the fish pirates were particularly active, authority was received from Washington to proceed energetically. Launches and special deputies were employed and several arrests were made. The Territory, by extending assistance to the Bureau of Fisheries, was able to obtain needed evidence. The naval patrol was actively engaged at all times and rendered valuable preventive service. Fish piracy, for this year, at least, has been broken up.

In the session of the territorial legislature held in the spring of 1919, bills were passed providing new and increased taxation upon fisheries products, creating the territorial fish commission, pro-

hibiting the pollution or obstruction of salmon streams, and establishing the office of labor commissioner, among the duties of which is the inspection of canneries and fishery establishments in regard to sanitary aspects of their operation as affecting laboring classes.

In the fiscal year 1918 there were released from the privately owned hatcheries 23,712,000 red salmon fry, for which, at the rate of 40 cents for each 1,000 fry, the owners were entitled to a rebate of $9,484.80 in Federal license taxes on canned product.

In the season of 1917–18 the total number of young red, or sockeye, salmon liberated was 90,390,200, of which number 66,678,200 were released from Government hatcheries. In the calendar year 1918 the take of red, or sockeye, salmon eggs at Government stations was 101,981,000 and by privately owned hatcheries 40,020,000. In the same period there were also taken 10,062,000 humpback-salmon eggs by Government hatcheries and 3,660,000 at one of the other hatcheries.

The number of persons employed in the fisheries in 1918 was 31,213. Of these, 17,693 were classed as whites, 5,251 as natives, 1,509 as Japanese, 2,734 as Chinese, 1,338 as Filipinos, 1,709 as Mexicans, and 979 as miscellaneous. The total number in 1917 was 29,491, or 1,722 less than in 1918.

The total investment in the fisheries in 1918 was $73,764,289, of which $63,901,397, or approximately 86 per cent, was invested in the salmon-canning industry. The investment in 1918 was greater than in 1917 by $18,826,740. Of the 1918 investment, approximately $34,500,000 was in southeastern Alaska, $14,250,000 in central Alaska, and $25,110,000 in western Alaska.

The total value of fishery products in 1918, exclusive of aquatic furs, was $59,099,483; the value of the 1918 products exceeded by $7,632,502 that of 1917, which was $51,466,980.

A very material increase occurred both in quantity and value of products in the salmon industry in 1918. As in previous years, the value of the output was several times that of all other fishery products combined. In 1918, for the first time salmon were taken commercially to a considerable extent in the Yukon River.

In 1918 the total number of salmon taken was 101,454,688. The take by species was as follows: Coho, or silver, 2,911,681; chum, or keta, 14,160,818; humpback, or pink, 48,316,362; king, or spring, 727,762; red, or sockeye, 35,338,065. The total take in 1917 was 92,600,495, or 8,854,193 less than in 1918.

The value of the output of canned salmon in 1918 represented about 95 per cent of the value of the total products of the salmon industry. The investment in the salmon-canning industry amounted to $63,901,397, of which $28,971,126 was in southeastern Alaska, $11,960,681 was in central Alaska, and $22,969,590 in western Alaska. The total investment in 1917 was $46,865,271, or $17,036,126 less

than in 1918. The number of persons engaged in 1918 was 26,502, an increase of 3,152 over 1917.

The halibut industry dropped from second to third place in 1918, the value of the product being exceeded by that of the herring industry. In 1918 the investment in the halibut industry was $2,607,792; in 1917 it was $2,200,987, or $406,805 less. The number of persons employed in 1918 was 1,186. The total production of halibut credited to the Territory was 13,869,706 pounds, valued at $1,667,686.

In 1918 there was a great expansion in the herring industry as a direct result of the exploitation work of the Bureau of Fisheries in 1917 to introduce the Scotch-cure method. This work also indirectly stimulated the operations of those who continued to use the Norwegian method. The output of herring was second in value only to that of the salmon industry in 1918. In 1918 the investment in this industry was $1,802,817, as compared with $562,002 in 1917, a gain of 220 per cent. The number of persons employed was 884, and the value of products was $1,819,538; the value of the output in 1917 was $767,729.

Other industries are the mild-curing and pickling of salmon, the cod, sablefish, whale, and shark fisheries and the packing of clams, shrimps, etc.

Fur seal service.—Commercial killing of fur seals was resumed on the Pribilof Islands in the season of 1918. There were taken on St. Paul Island 27,503 sealskins and on St. George Island 7,387, a total of 34,890 skins for the calendar year of 1918.

Two sales of dressed, dyed, and machined fur-seal skins from the Pribilof Islands were held at St. Louis in 1918. On April 22, the number of skins sold was 6,100, and the total price bid was $271,945, the average per skin being $44.58. At the sale on October 7, the number of skins disposed of was 2,000, and the total price bid was $103,440, an average of $51.72. The total number of skins sold during the year was 8,100, and the total amount bid at the two sales was $375,385.

Another census of the fur-seal herd was taken in 1918. The results showed a substantial increase in the size of the herd over the previous year, and were in keeping with the general upbuilding of the herd since the cessation of pelagic sealing several years ago as the result of the North Pacific sealing convention, effective December 15, 1911. A total of 496,431 seals were enumerated.

Territorial fish commission.—The territorial legislature of 1919 provided for the creation of a fish commission and the establishment of a hatchery. For this purpose the sum of $80,000 was appropriated. Part of this appropriation is being utilized in clearing obstructions from salmon spawning streams. All employees will be

appointed ex-officio Federal fish wardens to assist in maintaining the fishery regulations and to secure better cooperation with the Federal authorities.

Agriculture.—Many parts of Alaska contain land on which farming can be successfully followed, provided markets can be procured for the products. In the Tanana Valley farming has long since passed the experimental stage. In the Matanuska Valley splendid results, particularly with vegetables, have been obtained. In southeastern Alaska vegetables and the small berries are grown. Particularly near Fairbanks does one find well laid out and productive farms. There are 93 homesteads in the district, totaling 22,613 acres.

A small flour mill has been bought for the Department of Agriculture experiment farm, and many of the farmers are availing themselves of the opportunity of grinding flour from their own wheat. In a few years the Fairbanks district will be enabled to furnish wheat for the entire Yukon Valley.

The governor suggests that legislation be passed to enable the Department of Agriculture to distribute beef and milch stock to the farmers on long-time payments.

To assist the farmers, good roads should be furnished. The condition of both the Territorial and Federal road funds is such that the entire appropriations are now needed for maintenance and little new work can be undertaken until larger sums are available.

Public lands.—The records of the Surveyor-General's office show that during the fiscal year ending June 30, 1919, 18 townships, whole and fractional, were approved; 11 on the Seward meridian and 7 on the Fairbanks meridian.

There have been surveyed in Alaska, to this date, 134 townships, whole and fractional; 82 on the Seward meridian, 39 on the Fairbanks meridian, and 13 on the Copper River meridian.

During the present season surveys are being made along the Cook Inlet coast of the Kenai Peninsula, north of Kachemak Bay, and in the Chilkat Valley in southeastern Alaska.

The governor recommends the reorganization of the general land office in Alaska so as to have one office in the Territory that can speak authoritatively. In the present system every land claim becomes practically the subject of consideration by four different branches of the bureau. The governor suggests that this can be done in one of several ways; as a start the office of the surveyor general can be abolished with a considerable saving to the Government, and his duties delegated to either the supervisor of surveys or to the chief of the field service, to be handled with a minimum office force. The surveyor general is ex officio secretary of the Territory. At least these two offices should be separated and the latter office be filled

either by presidential appointment or made elective. There is nothing in common in the two positions.

National forests.—There are two great national forests in Alaska, the Chugach, comprising 5,417,852 acres, and the Tongass, comprising 15,449,717 acres. On May 2 and August 16, 1918, 199,680 acres were temporarily withdrawn from the public domain near Lituya Bay.

The governor does not believe in national forests for Alaska. He states that it is true that a certain amount of money is spent on roads and in cooperative agreements for roads, but if the same provisions could be made to cover public lands, the whole country would be better off. Those interested in the possible manufacture of pulp tell him that the industry would have undoubtedly been established in Alaska, if definite terms covering a period of years could have been arranged for, and if the water powers were not subject to a lease revocable at any time. In his last annual report, he suggested that there is no function performed by the Forest Service which could not be performed by the General Land Office.

The total receipts for the Tongass and Chugach National Forests for the fiscal year ended June 30, 1919, were $102,813.71. The total cost of administration of the two forests for the same period was $43,454.14.

The total number of applications received for forest homesteads on the Tongass Forest is 245, eight of which were received during the past fiscal year. The total number of applications received for lands within the Chugach National Forest is 407, only three of which were received during the past fiscal year. Patent survey is made by the Forest Service free of charge for all national forest homesteads just as soon as the applicant has complied with the homestead law.

There are at present 580 occupancy permits in effect on the Tongass Forest. Among the many users are 55 canneries, 69 cabins for which no rental is charged, 4 cold-storage plants, 320 residences for which an annual nominal rental fee is charged, 24 salteries, 8 sawmills, 1 whaling station, and 7 fox ranches. There are 159 occupancy permits in effect on the Chugach National Forest covering free agricultural uses, canneries, fox ranches, salteries, residences, herring pounds, etc.

On the Tongass Forest there were a total of 429 timber sales made, covering 42,295,000 board feet of saw timber and piling, and 38,403,000 board feet were actually cut during the fiscal year. On the Chugach there were 93 sales, covering 5,349,650 board feet; 6,360,990 board feet of saw timber and piling were cut during the fiscal year. In addition to the timber sold on the Chugach the Alaskan Engineering Commission cut approximately 5,758,000 board feet under free use.

The area of the Chugach Forest was reduced by 307,800 acres. This elimination was effected through presidential proclamation dated April 16, 1919. The areas eliminated include a strip of land 3 miles deep from Kachemak Bay to the Kasilof River, and the larger portion of the surveyed land in the vicinity of Anchorage, containing a considerable portion of land suitable for agricultural purposes, as determined by an extensive reconnoissance survey conducted by the Forest Service.

National park and national monuments.—Alaska has one national park (the Mount McKinley) and three national monuments. The park, of approximately 2,200 square miles, has as the central attraction Mount McKinley, 20,300 feet in elevation, the highest known mountain in North America. Its northern slopes embrace some of the greatest breeding grounds of game in Alaska, where it is no unusual sight to see herds of woodland caribou of from 200 to 1,000 animals, and sheep in bands of several hundred, while moose and bear are found in more limited numbers.

The Sitka National Monument, near Sitka, the old historic capital of Alaska, lying along Indian River and the bay, is one of the most beautiful spots in all Alaska. The reservation embraces 57 acres and contains a number of splendid totem poles which, through neglect, were rapidly falling apart. A small allotment of funds by the National Park Service has enabled the custodian to repaint and repair those poles which were in the worst condition. These totems it will be impossible to replace and they should be carefully guarded.

The Katmai National Monument, a reservation of approximately 1,700 square miles, surrounds the volcano, Mount Katmai, which "blew its head off" in 1912 and deluged the surrounding country with ashes.

The monument at Old Kasaan embraces 38.3 acres and contains some wonderful totems which, unless cared for, will soon disappear. The monument, which is under the Agricultural Department, is entirely neglected and seldom visited.

The Government railroad.—This project is covered under the heading "Alaskan Engineering Commission," page 53. The governor makes most favorable comment thereon and urges that appropriations therefor be made available so that uninterrupted progress can be made on construction. He states that it is very probable that even after completion the railroad will not immediately operate at a profit, but the deficiency will be more than offset by the new and taxable industries established along the route. Alaska has proved immensely profitable to the Government along the lines of established transportation. The country along the railroad will prove no exception.

Alaska insane.—Under a contract with the Secretary of the Interior the legally adjudged insane of Alaska are cared for at the

Morningside Hospital near Portland, Oreg., the contractor being the Sanitarium Co. The present contract expires on January 20, 1920. A new five-year contract with the same company has been executed, at a price of $41.25 a month per patient, which, in view of the rapid rise in the price of supplies, equipment, wages, etc., will be entirely inadequate. Twice since the signing of the armistice it has been necessary to raise salaries. In addition to the hardships encountered by the contractors due to high costs, beginning January 1, 1920, under a ruling of the labor commissioner for Oregon, three shifts will be required in the nursing and attending staffs. Steps should be taken to afford relief to the contractor so that the inmates of the sanitarium may not suffer in any manner.

Commerce.—The total commerce of Alaska with the United States for the fiscal year was $117,018,835, as compared with $131,767,788 for 1918, or a decrease of $14,748,953. The more important increases and decreases are as follows: The increase in the export value of sea-food products was $5,144,171; the decrease in the value of copper shipped was $5,978,824, while the export of domestic and foreign gold and silver from Alaska for 1919 amounted to $9,308,119, as compared with $15,134,879 for 1918, a decrease of $5,826,760.

On imports from the United States the following increases and decreases are shown: Increase on coal, $33,835; decreases, lumber, $212,820; liquors, $414,755; iron and steel, including hardware, $4,764,759; breadstuffs, $461,895. The total decrease in shipments from the United States to Alaska amounted to $8,736,041.

Imports from foreign countries amounted to $1,334,403 and exports to foreign countries of $1,074,367, which, added to the total commerce of Alaska with the United States, make the grand total commerce of Alaska for the fiscal year 1919 reach the sum of $119,427,605, as compared with $135,115,025 for 1918.

Transportation.—Chiefly due to war conditions, transportation to and in the Territory during the past year has been in a most chaotic condition. Steamers have been unable to maintain schedules and in many instances have entirely cut out former ports of regular call. A great hardship was worked particularly in many of the districts off the regular lanes of traffic.

The Prince William Sound ports during the winter were intermittently served by the two large steamship companies—the Alaska Steamship Co. and the Pacific Steamship Co.—with three regular ships. These had but small passenger traffic and little northbound freight, although full cargoes southbound, principally of ore.

The industry of the Territory is seriously menaced. As a matter of protection, the legislature of the Territory enacted a law creating a shipping commission, consisting of the governor, the secretary of the Territory, and the treasurer, empowering them to investigate traffic conditions and, if no remedial results can be procured, to

even go to the extreme of establishing a territorial steamship line, it being considered that to protect the industry of the Territory, it might be best to operate such transportation line even at an annual loss.

Federal roads in Alaska.—The Alaska Road Commission, constituted by act of Congress approved January 27, 1905, is composed of three officers of the Army, who report to the War Department through the office of the Chief of Engineers.

The total expended for all construction and maintenance to June 30, 1919, is $4,920,655.67. Of this amount $2,920,000, or 59 per cent, was appropriated at different times by Congress, and $2,000,655.67, or 41 per cent, from the Alaska fund. One thousand thirty-one miles of wagon road, 673 miles of sled road, and 3,223 miles of trail have been constructed and maintained since 1905. Approximately 400 miles of wagon road has a light gravel surface.

The appropriation granted for 1920 is $100,000, amounting to an allowance of $20 per mile, which makes it impossible for the commission to take care of the ordinary maintenance, and also makes it necessary to defer maintenance on a great many roads which are of great importance to the people of the Territory.

Territorial roads.—The road law enacted by the last legislature provides for the closest cooperation between the Territory and the Federal road authorities, and when full advantage is taken of the provisions of the law, most satisfactory results should follow.

In addition to roads constructed and maintained through Federal agencies, the legislature appropriated $375,000 for the biennium ending March 31, 1921. Under the provisions of the new road law, the apportionment to the road districts of the four judicial divisions may be expended under cooperative agreement with Federal agencies.

The Territory has partly constructed and wholly maintains 241 miles of wagon roads and 232 miles of pack or sled trails. Winter trails are staked across the tundra for the safety of travelers and relief cabins are erected where travel is dangerous.

Natives of Alaska.—The governor suggests that an Indian policy for Alaska should consist of, first, the elimination of communicable and hereditary diseases, and, second, training the young in useful trades within the Territory itself. Unless the native is made healthy and decently self-supporting, religious and scholastic education is, to a great extent, waste effort. The governor thinks that it is not demanding too much to ask that the Alaska natives have as much spent on them per capita as do the Indians of the States, and given equal consideration in proportion to numbers, in the establishment and maintenance of schools and hospitals. The Alaska natives will gradually become a considerable factor in the industrial development of the Territory. He draws attention to the fact that in addition to the expenditures by the Bureau of Education, the Terri-

tory is spending annually about $30,000 for the education of natives and half-breeds.

Alaska native school service.—The schools for native children in Alaska are supported by Federal appropriation under the supervision of the Bureau of Education of the Interior Department. The Territory is divided into five districts, each in charge of a superintendent of schools directly responsible to the chief of the Alaska Division of the bureau, whose headquarters are in Seattle. The Seattle office also functions as a purchasing and disbursing office for the service.

During the past year, 65 schools were maintained with a total enrollment of approximately 3,600, the highest monthly average attendance being 2,750. The enrollments in individual schools range from 12 to 169. Primarily because of the difficulty in securing suitable teachers, 6 of the schools operated the previous year were not opened. In spite of undeniable increases in costs of all kinds during the war, the bureau's appropriation for the education of these children during the past year was but $215,000, an increase of only $15,000 over the $200,000 received in 1907 and each successive year. Obviously the bureau not only must reduce its expenditures for supplies and materials to the lowest possible figure in order to maintain the school system established but is also very much handicapped in attempting to meet the increased salary schedule necessary to the efficiency of the personnel.

The necessity for enlarging the work among the natives of Alaska has annually been set forth in reports to this office. The immediate needs may be summarized as follows:

An appropriation for education of not less than $350,000 with which to meet the increased cost of operating the present school system and to provide school facilities for districts of Alaska which the bureau has been unable to enter for financial reasons.

A power schooner for use in making delivery of supplies to the stations during the open season of navigation and to be used as a training ship in seamanship as part of the education of young natives in southern Alaska.

Several trade schools in Alaska to enable promising young natives to complete their education under environments to which they are accustomed. Under present conditions, it is necessary for them to enter schools in the States, with the usual result of impaired health and making them unfit to return to their old environments.

A reimbursable fund with which to establish industries in native communities. The success the bureau has already had along this line shows what might be done under proper supervision. The native people can and will repay any loans of this nature, and industrial enterprises among them will not mean competition with the whites, but rather the development of native resources.

Alaska native medical service.—The ideal arrangement, of course, would be to have a sufficient number of small hospitals, physicians, and nurses so that professional care for serious cases would be within reach of all the stations of the Bureau of Education. With an annual appropriation of but $75,000 this can not be done. Under these financial limitations the bureau has been enabled to establish, operate, and maintain a complete hospital at Juneau of 20-bed capacity, an 11-bed hospital at Kanakanak, Bristol Bay, a similar sized one at Akiak on the Kuskokwim, and small hospitals in charge of a physician and one nurse at Nulato on the Yukon and at Kotzebue. Contract physicians were also employed at Ellamar, Cordova, Hoonah, and Nome. In addition to the nurses employed in the hospitals mentioned above, a nurse was stationed at each of the following places: Metlakatla, St. Michael, and Wales. Such a staff is absolutely inadequate to the requirements of the Territory, as was evidenced during the influenza epidemic which made such terrible inroads on the native population. The natives of Alaska are peculiarly susceptible to epidemics, and not only from a humanitarian standpoint should they be protected, but in the economic interests of the Territory should the native races be safeguarded.

During the present summer a hospital is being erected at Noorvik on the Kobuk River. It will be practically a duplicate of the Akiak Hospital, and will accommodate about 12 patients besides providing quarters for the staff.

An excellent start has been made in the medical work among the natives of southeastern Alaska, which district, however, is but a very small part of the Territory. The Bureau of Education should have an appropriation of at least three times the present one in order to provide for the needs of the natives in other parts of Alaska. Unless their physical well-being is adequately attended to, the educational efforts for the natives are of doubtful permanent value.

Alaska reindeer service.—Until 1892 Alaska had no reindeer. In that year and for 10 succeeding years, 1,280 deer were imported from Siberia. To-day there are in the neighborhood of 125,000 reindeer in Alaska. The primary object of the introduction of reindeer was to make the natives of Alaska economically independent. By a system of apprenticeship a native serves for four years in learning to care for the deer and receives 6, 8, 10, and 10 deer for the first, second, third, and fourth years, respectively. At the end of his apprenticeship he is a full-fledged herder and assumes charge of his herd. After his herd attains sufficient size, he in turn is required to take on an apprentice. Thus the system of distribution among the natives is perpetuated, and any native desirous of owning deer can either acquire them in this manner or can purchase them from another native.

So complete has been the distribution among the natives that at the present time the Government holds title to less than 3 per cent of the deer in Alaska. Seventy per cent are owned by the natives, while 5 per cent are held by the missions in Alaska for the benefit of the natives. The remainder is owned by Laplanders and whites. The Bureau of Education appropriation last year of $6,000 was used entirely in the completion of the distribution of deer among the natives. Through lack of funds the bureau is consequently handicapped in working out problems in connection with marketing the meat. The industry has now reached proportions where an outside market is imperative and the present area of high meat prices makes this the opportune time. Some efforts along this line have been made by the white owners and the present year should show considerable progress. However, several kinds of diseases have developed. Warble flies infest many of the deer and make the skins practically worthless, and the stock in many herds has deteriorated as a result of inbreeding.

To assist in these and other problems peculiar to the reindeer the Bureau of Education has employed a veterinarian with headquarters at Shaktoolik in the Norton Sound country who will give his entire attention to reindeer matters. This is an immense step in the right direction and it is hoped the bureau may be able to place similar specialists in other reindeer sections and that much good may result to this important industry.

Relief measures.—Biennial appropriations are made by the legislature to cover the following relief measures:

Rescue and relief of lost persons	$10,000
Pioneers' Home	107,200
Allowances for aged pioneers	40,600
Dependent children	12,000
Relief of destitution	15,000
Total	184,800

The above total does not include an appropriation of $93.000 and the unexpended balances of other appropriations for relief authorized by the governor during the three epidemics of influenza, 90 per cent of which expense was incurred among the natives and should have been borne by the Federal Government.

Ten per cent of the Alaska fund is expended for the relief of destitution by the United States district judges of the four judicial divisions. This in 1918 amounted to $21,962.10.

Game and game laws.—Probably due to loss in population, game seems to be on the increase throughout the Territory. Coyotes, however, have worked their way up through British Columbia and have entered Alaska by way of the White River. Wolves are greatly on the increase.

The governor again draws attention to the fact that the game laws are ill-advised and can not be enforced, especially with an appropriation which is entirely inadequate. He suggests that the jurisdiction over the game and fur-bearing animals be transferred to the territorial legislature. The governor entirely approves of the migratory bird treaty, but considers that the open season for killing birds should be advanced in Alaska and the Yukon territory, as practically all migratory birds have left the interior of Alaska by October 1.

"Bone dry" Alaska.—During the fiscal year there were 91 arrests made by the special officers for the suppression of the liquor traffic among the Indians, for violations of the liquor laws, 78 convictions and 13 acquittals. Fines, amounting to $8,410 were collected and jail sentences aggregating 1,168 days were imposed. Other arrests were made by the marshals of the several judicial divisions and convictions obtained which are not included in the above.

Under an annual appropriation by the Government of $15,000, there are four special officers for the suppression of the liquor traffic among the Indians employed—one in each of the judicial divisions. To properly enforce prohibition, this appropriation is absolutely inadequate; the distances are too great, the expense of travel too heavy. Very little real whisky is now coming into the country, but the resourceful bootlegger is distilling his own "hootch" in neat stills which can be set up on a kitchen stove. Some of the stills captured are marvels of ingenuity. The product of these illicit stills (commonly known as "White Mule," on account of its color and powerful "kick") is vile in the extreme and most injurious to health. If prohibition is to be thoroughly enforced, there must be more officers for its enforcement and a fund to be expended in detective work.

Aids to navigation.—Owing to the great extent of the coast line of Alaska, with the many islands and indentations, navigation has at all times been difficult and dangerous. Scarcely a year goes by without record of a serious wreck. As fast as money has been made available, new lights and other aids have been installed, each one of which marks some menace to the mariner. Gradually the Lighthouse Service is improving the safety of the coast, but the improvement is being too slowly effected and the money appropriated is not commensurate with the trade demands of the Territory.

Nineteen new lights were established in Alaska by the Lighthouse Service since June 30, 1918. Four lights were changed from fixed to flashing, and 1 gas and bell buoy, 11 buoys of other types, and 3 beacons were established.

The total number of aids to navigation in Alaska, including lights, gas buoys, fog signals, buoys and day-marks, in commission at the

close of the fiscal year ended June 30, 1919, was 459, including 178 lights and 8 gas buoys, representing an increase of 149 lighted aids since June 30, 1910, or over 400 per cent.

The Coast and Geodetic Survey.—The accomplishments of the Coast and Geodetic Survey in making hydrographic and geodetic surveys in the Territory of Alaska during the year for which this report is made, have been materially lessened on account of the fact that considerable of the equipment and many of the officers of that bureau have been assigned to the Navy and the Army to meet the military needs of the Government. The outcome has been that no vessel surveys have been made in Alaskan waters during the year, nor were any geodetic surveys made. The hydrographic surveys were confined to what was accomplished by two wire drag parties.

Mail service.—Great discontent over the mail service in Alaska is manifested on all sides and it is the inadequacy of the service which is hurting Territorial development. Some of the complaints of last year have been satisfied by amended regulations, but mail is still shipped to Alaska as express and freight; the mail clerks are still absent from the steamers, and business requiring action by return mail still languishes. Owing to the fact that freight mail pouches are no longer locked in a mail or express room, it is reported, on reliable authority, that robberies, particularly of parcels, are frequent. West of Seward conditions have been deplorable, owing to the letting of contracts to boats incapable of performing service. For over two months during a severe epidemic of influenza, Kodiak and Afognak Islands were cut off from communication, rendering it impossible to send medical relief.

Alaska fund.—The revenues derived by the Federal Government from business and trade licenses outside of incorporated towns for the fiscal year 1919, amounted to $280,906.80, as against $293,161.65 for 1918, a decrease of $12,254.85. The total revenues received from taxes levied by the Federal Government within incorporated towns, from business and trade licenses, amounted to $68,229.31, as compared with $81,101.28 in 1918. The governor recommends that the Alaska fund be covered into the Territorial treasury for expenditure under the direction of the legislature.

Territorial finances.—Taxes collected and other revenues accruing to the Territory are covered into and disbursed from the territorial treasury, the fiscal year of the Territory corresponding to the calendar year. The condition of the territorial treasury for the fiscal year ended December 31, 1918, was as follows: Balance on hand January 1, 1918, $682,493.11; total receipts from all sources, $475,450.55; total disbursements under appropriations made by the territorial legislature, $624,100.85; balance of cash on hand December 31, 1918, $533,842.81.

At the close of the fiscal year covered by this report there were 15 territorial banks and 3 national banks in the Territory—a loss of 1 during the year. No new banks were established during the year and there were no failures, the loss being occasioned by one of the territorial banks at Nome voluntarily liquidating its affairs.

Deposits in the several territorial banks, at call of April 30, 1919, aggregated $6,047,543.74, as compared with $5,974,728.82 under corresponding call of May 8 of the year previous.

Corporations.—On July 1, 1918, there were 258 domestic and 469 foreign corporations transacting business within the Territory, a total of 727. During the fiscal year 1919 there were 17 new corporations formed and 18 foreign corporations registered. There were 33 domestic and 31 foreign corporations dissolved, making a total number of 698 still transacting business, a net loss for the year of 29.

Incorporated towns.—There are at present 17 incorporated towns in Alaska, listed as such with the Secretary of the Territory, but the town organization of Chena has ceased to exist, practically all the inhabitants having moved away and no action has been taken for the last three years to conduct a municipality.

Reports received from 14 of these towns show a total assessed valuation of $14,195,025. The rates of taxation on the assessed valuation range from 1 to 2 per cent, the average being 1.5 per cent.

Schools.—The public schools of Alaska are administered under both Federal and Territorial laws. The Federal law, known as the Nelson law, provides for schools outside of incorporated towns or incorporated school districts and receives for their maintenance 25 per cent of the Alaska fund. The Territorial laws provide for schools in incorporated towns or districts, one-fourth of the cost of maintenance being borne by the town or district by taxation of real and personal property and three-fourths by the Territory. Territorial laws provide for the establishment of night schools and carry an appropriation for the support of the same. Four communities took advantage of the provisions of the law during the year.

There are 13 schools in incorporated towns and 2 in incorporated school districts, supported in part by territorial appropriation. The averages for the 15 schools, as shown by the table of statistics, are as follows: Average number of teachers, 5.8, with average yearly salary of $1,279.93 per teacher; average enrollment 130.33; average daily attendance, 100.31; average cost of maintenance, exclusive of teachers' salaries, $3,970.53. The average cost per pupil was $87.42, as compared with $80.14 for the previous year.

For the year 1918–19 schools were maintained in 47 districts outside of incorporated towns and incorporated school districts. The 47 schools employed 60 teachers and had an enrollment of 1,209, as compared with 1,180 the previous year. The average number of

pupils per school was 25.7, as compared with 25.6 the previous year. A total of $109,650.61 was expended for maintenance, at an average cost of $2,332.99 per school, as compared with $2,174.93 for the previous year. The average cost per pupil was $90.69, as compared with $84.79.

Territorial legislature.—The fourth legislative assembly convened at Juneau, the capital, on March 3 of this year, and remained in session for the authorized 60 days. Sixty-two laws were enacted. One bill was vetoed by the governor and two failed of approval after the legislature had adjourned.

Labor conditions.—There has been a general shortage of labor throughout Alaska. Mines of all kinds have been working short-handed, resulting in a curtailment of output. The gold mines have been the greatest sufferers, as the operators have not been able to compete for labor as have the copper mines when that metal was in demand.

Wages in all classes of mines compare favorably with wages paid in the States, but with a nation-wide demand, laboring men prefer to work in larger communities, although the opportunities for saving are better in Alaska than almost anywhere else; rents are lower and there are not the temptations to spend.

Selective service.—The operation of the selective-service system in Alaska was carried out with little confusion, under the direction of the governor, assisted by an executive officer, commissioned by the Secretary of War. There were 21 local boards scattered throughout the Territory and four district boards, one for each of the four judicial divisions.

Two thousand two hundred and twenty-three registrants of the class of June, 1917, were inducted and sent to camp, 1,656 of whom were delivered to Alaskan posts. It is estimated that fully 1,500 young men left Alaska and enlisted in the States, either in the Army or Navy and are credited to the States wherein enlistment took place. Many Alaskans are not credited to Alaska in the draft, as a large number of registrants, although they had been in the Territory for years, gave their home address as some place in the States, usually where their parents resided. In consequence, these registrants, when inducted, were credited elsewhere.

Tourist travel.—More tourists have visited Alaska this season than ever before. This is due largely to the closing of trans-Atlantic travel to pleasure seekers and to the well-placed advertising by the bureau of publicity. In fact, travel has been so heavy that returning residents of the Territory have often been obliged to wait for weeks before being able to procure accommodations. The class of tourists has been remarkable. There have been noted publicists, authors,

jurists, musicians, educators, naturalists, and men of world affairs. All have expressed themselves as being astounded at the marvels of scenery, the industries, latent possibilities, and the intelligence and refinement of the population. Some have made investments. All have become ardent supporters of the country.

Public buildings.—The need of a public building at the capital is yearly becoming more apparent. The Federal offices are scattered in various parts of Juneau, in wooden structures, which may at any moment be destroyed by fire. The records of these offices are unprotected, and, if lost, could not be replaced. The office of the governor is housed in a shack, constructed many years ago as an Indian school. The building is unsafe in its present condition, but must continue to be occupied, as suitable quarters can not be procured for the amount appropriated by Congress for rental of office. There is, of course, as in the other offices, the ever-present danger of fire, which, should it break out, will undoubtedly destroy all the valuable archives and books and collection of the historical library and museum. Some of the books are priceless.

Office of the governor.—The office of the governor does not receive the support to which it is entitled. In the face of daily increasing costs the appropriation for salaries of clerks, travel expenses, maintenance of the office and the executive mansion and other contingent expenses for the past two fiscal years has been cut from the prewar allowance of $7,500 per annum to $6,000. On December 31, 1918, the entire amount available for contingent expenses had been expended.

The importance of the office is growing every year and the expense must be met from some source. Territorial assistance has been rendered under the excuse that the governor is the executive head of territorial laws. A large part of the maintenance expenses properly belonging to the Federal Government has been borne by the governor personally. Increased salary for the secretary to the governor is asked as well as additional clerical assistance.

Recommendations.—In conclusion, the governor submits a list of the principal recommendations detailed in the body of his report as follows:

Reimbursement of the Territory for money spent for the relief of natives.

Consolidation of all governmental authority possible in the Department of the Interior, thus doing away with conflicting departmental jurisdiction.

Removal of restrictions on export of birch timber from public lands.

Establishment of a uniformed constabulary.

Assignment of naval or Coast Guard ships to continuous duty in Alaskan waters.

Reimbursement of chrome producers for losses incurred while operating under encouragement from the Government.

Restoration of the prewar appropriation of $100,000 to the Division of Mineral Resources of Alaska, of the United States Geological Survey.

Transfer of jurisdiction over the fisheries to the Territory.

Exemption of Alaskan canneries from the provisional regulations covering the administration of Title XII of the revenue act of 1918, imposing a tax on the employment of child labor.

Assistance to farmers by loan of money and cattle.

Consolidation of authority in local land offices and creation of office of secretary of the Territory.

Restoration of national forests to the public domain.

Appropriation for Mount McKinley National Park.

Increase of contract price for the care of the Alaska insane.

Increased telegraph service.

Increased appropriations for roads and trails.

Increased appropriation to the Bureau of Education for work among the natives.

Appropriations for the reestablishment of musk-oxen in northern Alaska.

Increased appropriations for the protection of game and the suppression of the liquor traffic.

Increased appropriation for the establishment of aids to navigation.

Increased appropriations for coast surveys.

Renewal of mail contract system for the delivery of mail.

Passage of an act covering the revenues now accruing to the Alaska fund, into the territorial treasury.

Amendment of organic act to grant full territorial powers of legislation to Alaska.

Authorization for the construction of a public building at the capital.

Increased support to the office of the governor.

HAWAII.

The report of the governor of Hawaii shows that the financial situation and other conditions have been generally good throughout the Territory during the year ended June 30, 1919. With the rest of the United States the Territory has seriously felt the increased cost of living; a policy, however, of home production of foodstuffs, begun during the war, the lessons of thrift which the war taught, the liberal wages generally paid in various employments and the mild climate of the islands have tended to lessen the hardships resulting therefrom. Sugar and pineapples continued to be the main

crops of the islands. The yield of sugar for the year 1919 is estimated at 600,000 tons, and that of pineapples at 5,000,000 cases.

The future holds promise of a great shipping business for the ports of the islands, in that many of the vessels which will carry freight and passengers on the Pacific Ocean will touch at Honolulu and other harbors. The Territorial government, as well as private business interests are using every effort to make the ports, particularly those of Honolulu and Hilo, attractive in anticipation of this coming traffic.

The governor expresses the opinion that the Territory's borrowing capacity, as prescribed by section 55 of the organic act of the Territory, which now permits the borrowing to a limit of 7 per cent of the assessed valuation of the property in the Territory and in any single year not more than 1 per cent of such assessed valuation, should be increased upon the condition that the extra amount of money provided shall be used only for wharf and harbor improvements. Many of the ships which had formerly called at Honolulu were commandeered for war purposes, causing congestion in passenger traffic and in freight during the past two years. There is a promise, however, that a number of these vessels will shortly be returned to the island trade. On the town side of Honolulu Harbor the Territory is constructing new concrete wharves to accommodate for many years all types of vessels which may call for freight or passengers. To accommodate the trans-Pacific trade, which calls mainly for fuel, water, and supplies, the Territory has acquired title to Sand Island on the west side of the harbor. This island was originally a coral reef covered with water at high tide, but the United States Engineers in their dredging operations pumped material on it raising it to a grade above high-water mark.

On August 21, 1919, Hon. Josephus Daniels, Secretary of the Navy, officially opened the new concrete dry dock at Pearl Harbor, in the island of Oahu. It is 1,001 feet long, 123 feet wide, 35 feet deep, and can accommodate the largest vessel afloat. In addition, there are all the necessary shops for making repairs to vessels, and also a coal dock with storage space for a large quantity of coal.

The business of the Territory is largely agricultural and the bulk of the land most suited to agriculture is in localities deficient in rainfall, making large irrigation projects necessary. Extensive irrigation systems have been developed on the four main islands of the group, and without the water thus supplied most of the larger plantations could not exist. This fact justifies the large expenditures that have heretofore been made in developing the systems that carry water, often through many miles of ditches, tunnels, and pipes from the streams in the rainy sections to the cane fields. Besides the use

of surface streams important developments of artesian wells have taken place, particularly on the island of Oahu. The storage of water in large quantities has not been possible on account of unfavorable topographic features, though there are many small reservoirs. Its water resources are one of the Territory's most valuable assets and should be developed to the fullest extent, so that more land may be brought under cultivation or the land under cultivation may be made more productive.

Comparisons of rainfall and runoff show that only about 30 or 40 per cent of the rainfall reaches the sea by surface streams, evidencing the fact that enormous quantities of water flow from the mountains to the sea in underground channels. The Water Resources Branch of the United States Geological Survey is working in harmony with the division of hydrography of the Territory in the study of surface-water streams as well as in the location and utilization of underground waters.

The organic act of the Territory provides that upon petition of 25 or more qualified citizens the commissioner of public lands shall cause to be surveyed and opened for homesteading any tract of government land desired by the petitioners. Under this law tracts of land are now being opened for homesteading as the general land leases expire. The most recent homestead drawing took place in February of 1919, when approximately 5,500 acres of government cane land at Waiakea, South Hilo, Hawaii, was given out in 183 lots, and 2,242 applicants participated in the drawing for these lots, which is an indication of the eagerness with which homesteads are sought. It is known, however, that a large percentage of the applicants had no desire to become bona fide homesteaders, but took a chance on the securing of a lot for speculative purposes. Furthermore, a much larger percentage of the applicants were not in a position financially to handle a homestead proposition. This was clearly indicated by the fact that of the 183 successful applicants, 50 per cent had to borrow money to make the required payment of 10 per cent on the purchase price at the time of selecting the lots, and a large number did not have the money to purchase a steamer ticket to Hilo.

The Territorial legislature, at its 1919 session, adopted a resolution, which a Territorial commission is to take to Washington in 1920 with a view to having Congress amend the organic act so that land matters can be handled in such a way as to do justice not only to those applying for the land but to the taxpayers of the Territory.

Imports and exports.—The imports for the year ended March 31, 1919, were $50,743,793, a decrease over the previous year of $1,057,411. The exports for the year ended March 31, 1919, were $88,250,021, an increase of $7,703,415 over a similar period for the previous

year. The following table shows the imports and exports by countries for 1918 and 1919:

Countries.	Imports.		Exports.	
	1918	1919	1918	1919
Australia	$118,443	$138,289	$20,284	$36,141
Other British Oceania	71,974	67,914	161,923	106,720
British India	834,512	1,372,469	.....	.....
Canada	345,340	431,760	88,856	3,975,849
Chile	1,001,089	871,328	.....	.....
France	4,304	1,822	.....	.....
Germany	6,064	1,535	.....	.....
Hongkong	385,011	465,209	11,125	7,485
Japan	3,672,468	4,558,499	626,624	548,758
United Kingdom	68,991	47,095	196	1,114
Other foreign	.....	366,404	242,210	164,840
Total foreign	6,797,048	8,322,319	1,151,218	5,840,907
United States	45,004,156	42,421,474	79,395,388	82,409,114
Grand total	51,801,204	50,743,793	80,546,606	88,250,021

The following table shows the domestic exports by articles for the fiscal years 1918-19:

Articles.	United States, 1919.		Foreign, 1919. [1]	
	Quantity.	Value.	Quantity.	Value.
	Pounds.		*Pounds.*	
Sugar	1,097,540,707	$64,557,857	70,054,101	$3,939,432
Coffee: Raw	6,417,524	1,003,342	1,221,696	180,806
Fruits and nuts [2]	.....	12,055,579	.....	60,765
Rice	1,497,020	131,594	4,900	356
Hides	1,643,515	337,611	.....	.....
Other	.....	3,969,407	.....	1,654,476
Total	.....	82,055,390	.....	5,835,835

Articles.	Total, 1919.		Total, 1918.	
	Quantity.	Value.	Quantity.	Value.
	Pounds.		*Pounds.*	
Sugar	1,167,594,808	$68,497,289	1,080,928,593	$64,109,967
Coffee: Raw	7,639,220	1,184,148	3,206,022	466,689
Fruits and nuts [2]	.....	12,116,344	.....	8,640,838
Rice	1,501,920	131,950	1,247,731	84,813
Hides	1,643,515	337,611	1,734,319	398,719
Other	.....	5,623,883	.....	6,786,516
Total	.....	87,891,225	.....	80,487,542

[1] For fiscal years ending Mar. 31. [2] Mostly pineapples.

Customs and internal revenue receipts.—Customs receipts for the year were $858,258.25, as against $1,009,243.48 for the previous year. The total customs receipts since the organization of the Territorial government in 1900 aggregate $24,827,883.83. Internal revenue receipts yielded $5,831,933.19, a decrease over the previous year from this source of $3,854,907.75.

Territorial finances.—On July 1, 1905, local governments in Hawaii were established for the first time. The Territory was then divided into four counties, one of which, namely, that comprising

the island of Oahu, was converted on January 1, 1909, into a city and county, known as the city and county of Honolulu, with a mayor. The leper settlement on the island of Molokai formed a fifth county, controlled by the Territorial board of health. The Territory continues to collect and pay over to the city and county of Honolulu and the counties of the Territory the greater part of their revenues, and in return receives back from them the cost of assessing and collecting taxes and the interest and sinking fund on bonds issued by the Territory for the benefit of the counties.

The income of the various counties aggregated $4,692,859.63, as against $3,872,239.17 for the prior fiscal year. The assessment of property, real and personal, in the Territory during the year aggregated $250,524,346, as against $235,650,967 for the prior year.

The total revenues collected by the Territory and the counties amounted to $7,921,671.90, and the total expenditures aggregated $8,633,189.11. The current cash balance on hand June 30, 1918, was $711,517.21, and the current cash balance June 30, 1919, was $442,609.95.

Bonded indebtedness.—By the provisions of section 55 of the act of April 30, 1900 (31 Stat., 114), as amended by the act of May 27, 1910 (36 Stat., 443), the Territory is permitted to issue bonds not to exceed 7 per cent of the total assessed value of the property of the Territory, but not more than 1 per cent in any one year. The last completed assessment aggregates $250,524,346, and the borrowing capacity is therefore $17,536,704.22, the outstanding bonds issued at present amounting to $9,194,000. The legislature at its 1919 session provided for a bond issue of $2,231,000. Since June 30, 1919, bonds amounting to $200,000 have been issued, and the Territorial treasurer is now endeavoring to float additional bonds to the amount of $1,500,000. The issue of $200,000 is for the purchase of the Irwin estate property at Wakiiki Beach, Honolulu, as a memorial park for Hawaii's heroes in the recent World War.

The Territorial bonded indebtedness June 30, 1919, is as follows:

Date of issue.	Term of years.	Interest.	Sale price.	Percentage basis.	Aggregate outstanding.	Date due.	Where sold.
		Per cent.					
Oct. 4, 1905	5 to 15	4	$101.375	3.70	$270,000	Oct. 4, 1920	Honolulu.
Jan. 2, 1906	5 to 15	3½	98.125	3.66	750,000	Jan. 2, 1921	New York.
Oct. 1, 1907	5 to 15	3½	98.150	3.66	294,000	Oct. 1, 1922	Honolulu.
Oct. 1, 1909	5 to 15	3½	98.250	3.65	200,000	Oct. 1, 1924	Do.
Aug. 1, 1911	20 to 30	4	101.5875	3.88	1,500,000	Aug. 1, 1941	New York.
Sept. 3, 1912	20 to 30	4	100.5887	3.985	1,500,000	Sept. 3, 1942	Do.
Sept. 15, 1914	20 to 30	4	100.01	4.00	1,430,000	Sept. 15, 1944	New York and Honolulu.
May 15, 1916	20 to 30	4	100.00	4.00	1,750,000	May 15, 1946	Do.
Aug. 1, 1917	20 to 30	4	98.04	4.08	1,500,000	Aug. 1, 1947	Do.
Total..					9,194,000		

The total bonded debt on July 1, 1918, was $8,749,000, which was increased by the sale of $445,000 of the Aug. 1, 1917, issue of 4 per cent public improvement bonds, 1917, out of a total authorized issue of $1,500,000.

Bank deposits and insurance.—Twenty-six banks were in operation during the year, distributed as follows: Nine in Honolulu, two at Waialua, and one each at Schofield and Waipahu, on the island of Oahu; three at Hilo, two at North Kona, and one each at Honokaa and North Kohala, on the island of Hawaii; one each at Wailuku, Kahului, Paia, and Lahaina, on the island of Maui; and one each at Lihue and Waimea, on the island of Kauai. Three are national banks, namely, one at Honolulu, one at Schofield, and one on the island of Maui. One of the banks is solely a savings bank, two are solely commercial, and the remainder are both commercial and savings banks.

Bank deposits at the end of the year amounted to $35,349,134.36, of which amount $24,898,287.81 were commercial deposits and the remainder, $10,450,846.55, were savings deposits.

Fire insurance premiums during 1918 amounted to $932,259.59, and fire losses to $50,702.58; marine premiums amounted to $594,739.37, and losses to $50,833.44. Life insurance written was valued at $5,271,700.40, the premiums paid thereon amounted to $268,290.20, and the losses paid aggregated $526,694.31.

Corporations.—During the year 79 corporations were created and dissolved, as follows, to wit: Created, mercantile 56, dissolved 14; agriculture, created 6, dissolved 4; banking, created 1; savings and loans, created 2; eleemosynary, created 14; leaving at the close of the year 853 domestic corporations, an increase of 61 in all. The total capitalization of domestic corporations other than eleemosynary, etc., is $175,676,553, an increase of $4,292,610, or 2.50 per cent for the year. Foreign corporations to the number of 152, as compared with 144 of the preceding year, are authorized to do business in the Territory. The classes, number, and capitalization of the domestic corporations now in existence incorporated before and after the transfer of sovereignty to the United States are as follows:

Hawaiian corporations.

	Number.			Capital.		
	Incorporated before Aug. 12, 1898.	Incorporated since Aug. 12, 1898.	Total.	Incorporated before Aug. 12, 1898.	Incorporated after Aug. 12, 1898.	Total.
Agricultural	45	110	155	$47,866,750	$36,036,515	$83,903,265
Mercantile	37	438	475	16,141,125	50,680,203	66,821,328
Railroad	5	4	9	7,370,000	7,139,960	14,509,960
Street car	.....	2	2	.....	1,950,000	1,950,000
Steamship	1	1	2	3,000,000	6,000	3,006,000
Bank	1	7	8	600,000	2,750,000	3,350,000
Savings and loan	.....	15	15	.....	836,000	836,000
Trust	1	6	7	200,000	900,000	1,100,000
Insurance	.....	2	2	.....	200,000	200,000
Eleemosynary	34	144	178	.....	.....	.....
Total	124	729	853	75,177,875	100,498,678	175,676,553

Public lands.—The following table shows the total area of Government lands and their estimated valuation as of June 30, 1919:

Classification.	Area.	Total area.	Total valuation
Agricultural lands		44,288.16	$3,896,984.75
Cane lands	25,659.19		
Other agricultural lands	16,147.13		
Rice and taro lands	2,123.00		
Fish ponds, etc	358.84		
Net homestead area		35,802.78	1,228,864.75
Homesteads sold, amount unpaid	21,134.85		
Homesteads opened, untaken	12,178.75		
Homesteads surveyed, not opened	2,489.18		
Homesteads, exchanges and reserves		1,887.62	108,378.00
Pastoral lands (not cultivable)		458,179.94	1,326,484.94
Total salable lands		540,158.50	6,560,712.44
Total forest lands		592,958.00	2,786,084.69
Forest lands	215,085.35		
Forest reserves	377,872.65		
Total area of lands of value		1,133,116.50	
Lands, no value		507,126.69	
Total public lands		1,640,243.19	9,346,797.13

Homesteads.—There were taken up during the year 552 homestead lots covering an area of 8,877.364 acres, at valuations aggregating $563,942.85, or $63.53 per acre on the average. The homesteads taken averaged 16.082 acres each. They were taken by different nationalities as follows: Hawaiians, 165; Portuguese, 67; Americans, 47; others, 75. To enable homesteaders to obtain homesteads of suitable sizes for their needs they are given the option of taking one or two, or in some cases more lots. There were taken under special homestead agreements 473 lots, under certificates of occupation, 16; under right-of-purchase leases, 39; under cash freehold agreements, 2; homestead leases, 22; and special sales agreements, 37.

During the year 78 homesteads were surrendered or forfeited, covering an area of 1,766.823 acres, valued at $25,825.21. During the same period 92 transfers of homestead lots were made, having an area of 1,892.69 acres.

A total of 206 planting agreements, representing 3,911.07 acres, were signed. During the year there were sold at auction for cash 28 lots, including residence, church, and business site lots, containing a total area of 69.364 acres, for $10,691.75. A total of 70 general leases covering 88,319.498 acres were sold at an aggregate annual rental of $22,992.82.

Patents, leases, and licenses.—There were issued during the year 229 patents, covering an area of 2,946.76 acres, for considerations aggregating $106,161.87 or at the rate of $36.02 per acre. Of these 35 were right-of-purchase leases, 10 land exchange, 35 time payments, 7 cash freehold agreements, 47 cash purchases, 44 preference rights, 1 compromise with abutting owner. There were also issued 3 patents based on land-commission awards upon payment of commutation, the

area being 3.328 acres and the commutation $34. Land and water licenses, seven in number, were issued, bringing a total annual rental of $2,492.20.

Revenues and disbursements.—The total receipts of the land department were $545,751.13 as compared with $575,015.21 for the preceding year. The expenditures of the land department were $33,905.74 as against $32,640.01 during the previous year.

Population, immigration, and labor.—The estimated population, including that of the Army and Navy, on June 30, 1919, was 263,666, an increase of 70,757, or 36.68 per cent since the census of 1910. The estimated population of Honolulu, the capital of the Territory, is 78,200. The estimated population of the islands as of June 30, 1919, is as follows: Hawaiian, 22,600; part Hawaiian, 16,660; Portuguese, 25,000; Spanish, 2,400; Porto Rican, 5,400; other Caucasian, 31,000; Chinese, 22,800; Japanese, 110,000; Filipino, 22,000; all others, 5,806.

The number of births during the year was 9,164, as against 9,404 for the previous year. The birth rate per 1,000 population was 34.76, as compared with 36.71 for the previous year. The total number of deaths from all causes was 4,051, as against 4,572 the previous year. The total number of steerage arrivals was 7,435, as against 7,321 for the previous year; the number of departures from the islands was 7,401, as against 8,885 for the prior year, divided as follows: Chinese, 495; Japanese, 5,199; Filipinos, 994; Hindus, 1; Koreans, 33; Porto Ricans, 43; Portuguese, 226; Spanish, 283; Russians, 127; all others, 538.

Public health.—An analysis of the morbidity and mortality statistics shows an increase of 41 in the number of deaths and of 12,577 in the number of contagious diseases as compared with the previous year. The large increase in contagious diseases is due to the epidemic of influenza, which was made a reportable disease by resolution of the board of health on October 21, 1918. In view of the fact that the deaths from influenza number 612 and the total of deaths increased but 41 over the fiscal year ending June 30, 1918, the health of the Territory may be considered to have been good, and the percentage of deaths, especially from influenza, much less than in most communities on the mainland.

The total number of deaths was 4,051, and the annual death rate for 1,000 of population was 15.36. There were 14,616 cases of contagious diseases reported. Tuberculosis, leprosy, and measles increased in numbers while other diseases decreased. No case of bubonic plague was reported during the year; the number of cases of typhoid fever decreased 50 per cent.

Insane asylum.—At the end of the fiscal year, June 30, 1918, there were under treatment in the institution, paroled, and escaped, 251 males and 94 females, a total of 345. There were admitted during

this year 84 males and 33 females, a total of 117. A total of 462 patients, 335 males and 127 females, were treated during the year. A total of 34 patients, 22 males and 12 females, were discharged as recovered, and 5 males and 3 females were discharged as improved during the year. For the same period of time 38 deaths occurred, 30 males and 8 females; there remaining in the institution and on parole as of June 30, 1919, 278 males and 104 females, or a total of 382.

Leprosy.—The number of lepers living at the settlement at Kalaupau and Kalawao during the year was 669, and of these 425 were males and 244 were females; one was released on parole and 57 died, leaving at the settlement on the 30th day of June, 1919, a total of 611. The nationality of the patients at the settlement was as follows: American, 1; Belgian, 1; Chinese, 24; Filipino, 18; German, 4; Hawaiian, 363; Japanese, 14; Korean, 13; Part-Hawaiian, 123; Portuguese, 44; Porto Rican, 4; Spanish, 1; New Hebrides, 1. At the Kalihi Hospital there were on the 30th day of June, 1918, 38 patients, and 125 were admitted during the year; 60 were transferred to Molokai; 10 were declared not lepers; 19 were paroled and allowed to return to their homes with orders to report regularly to the Government physician in their district; and 6 died, leaving 65 patients in the hospital on the 30th of June, 1919. President Dean, of the College of Hawaii, has given valuable assistance in the preparation of chaulmoogra oil. The results of the last year's work are reported to be especially gratifying. Twenty patients in all were paroled and each one has been examined regularly without recommittal.

Transportation facilities.—Serious congestion in passenger travel and frequent long waits in freight and mail accommodations have continued during the year, owing to a number of large vessels having been in war service in the Atlantic Ocean. Long lists of persons desiring to go to the mainland have crowded the books of the steamship companies for months ahead of sailing dates and hundreds of persons have been unable to secure transportation.

The situation will undoubtedly grow better shortly, and the increase of commerce on the Pacific Ocean will send a larger number of vessels to Hawaiian ports.

Traffic with the mainland.—The Matson Navigation Co. operates the *Manoa*, *Sachem*, and *Lurline* of 6,805 tons, 3,130 tons, and 5,928 tons, respectively, between San Francisco and Honolulu, and the *Enterprise*, 2,675 tons, between San Francisco and Hilo.

Three big steamers of this company, the *Maui*, *Matsonia*, and *Wilhelmina* of 10,261 tons, 9,728 tons, and 6,974 tons, respectively, were operated by the United States Government in the war zone and are still retained for Government purposes. The *Lurline* and

Manoa made three voyages to Manila during the year, calling at Honolulu both ways.

In the freight trade the *Hyades*, 3,753 tons, and the *Annie Johnson*, power schooner, 1,049 tons, were recently returned to island traffic after having been requisitioned by the Federal Shipping Board between October, 1918, and April, 1919. Sundry freight vessels of American and Danish registry are consigned to this company, and all have taken cargoes of sugar or canned pineapples on their return voyages to San Francisco or Atlantic ports. The company has recently instituted a Seattle-Honolulu-San Francisco triangular freight service with four steamers which were built for the United States Shipping Board. It is anticipated that when this line is fully established there will be a sailing every 10 days from Seattle.

The American Hawaiian Steamship Co., which has been in the island trade since January, 1901, has operated during the year 1919 a number of Shipping Board vessels allotted to it in place of its regular vessels, all of which had been requisitioned by the Government for war work and placed in service on the Atlantic Ocean. This substitute fleet has transported approximately 185,000 tons of sugar during 1919 from Hawaiian Island ports to Atlantic ports via the Panama Canal. As the Government will probably soon release the regular fleet, it is anticipated that the regular service between New York and the Hawaiian Islands via the canal will be resumed during the early part of 1920.

Through traffic.—The China Mail Steamship Co. operated the steamers *China* and *Nanking* between San Francisco and oriental ports, carrying first, second, and third class passengers to and from Honolulu. Early in May, 1919, the *Nanking* was requisitioned by the Federal Government for war purposes, and it is not the intention of the owners to have this vessel call at Honolulu when returned to private operation.

The Pacific Mail Steamship Co. has continued to operate the *Ecuador*, *Venezuela*, and *Colombia*, vessels of 14,000 tons each, between San Francisco and oriental ports with stop-overs at Honolulu both ways. In addition, the company has a Manila-East India service with two 16,000-ton passenger and freight steamers, the *Santa Cruz* and *Colusa*, which also stop regularly at Honolulu on the homeward voyage.

The Toyo Kisen Kaisha is again operating its full fleet of steamers, consisting of the *Shinyo Maru* and *Tenyo Maru*, of 22,000 tons each, the *Siberia Maru* and *Korea Maru*, of 20,000 tons each, the *Nippon Maru*, of 14,000 tons, and the *Persia Maru*, of 9,000 tons. These vessels are on the run between China, Japan, and Honolulu, and San Francisco, while the *Anyo Maru*, of 18,500 tons, the *Kiyo Maru*, of

17,200 tons, and the *Seiyo Maru*, of 14,000 tons, are on a run including China, Japan, Honolulu, San Francisco, Mexico, Panama, and South America. These three vessels call at Hilo after leaving Honolulu on the outward trip from Japan. The *Persia Maru* and *Seiyo Maru* were recently returned to the company by the United States Government after seeing considerable service in the Atlantic war zone. With the return of the *Seiyo Maru* to the South American service the *Nippon Maru* was again placed on her regular run between San Francisco and the Orient.

The Oceanic Steamship Co. is operating the two passenger steamers *Sonoma* and *Ventura*, 6,200 tons each, and the freight steamer *Jacox*, 3,500 tons, on the run between San Francisco and Sydney, by way of Honolulu and Pago Pago. The *Sonoma* and *Ventura* touch at each point every four or five weeks. The *Jacox* makes the round trip every three months.

The Canadian-Australasian Royal Mail Line has the *Niagara* and *Makura*, 13,500 and 8,075 tons, on the Sydney-Vancouver run. Steamers sail from Honolulu north about every 28 days. It is stated that the *Makura* will eventually be removed and another steamer, probably a trifle larger than the *Niagara*, put in her place. The trip from Sydney to Vancouver and return requires 36 days, including a stop of five days at Vancouver.

The Standard Oil Co. operates a fleet of five steamers between the mainland and the Territory. These vessels delivered during the calendar year 1918 a total of 495,080 barrels of fuel and refined oils and 26,433 cases and 989 barrels of lubricating and refined oils.

The Associated Oil Co. operates four vessels and during the fiscal year these delivered 477,802.27 barrels of fuel oil.

The Union Oil Co. of California, which operates four steamers, received during the fiscal year 53,332.94 barrels of fuel oil.

A number of sailing vessels continue to bring general merchandise and coal from foreign ports.

Interisland traffic.—Most of the interisland traffic is conducted by the Inter Island Steam Navigation Co. (Ltd.), which operates a fleet of 12 steamers, varying in length from 136.1 feet to 252 feet and from 11.5 to 18 feet draft; from 341 to 1,566 gross tons and from 201 to 940 net tons. The total tonnage is 8,987 gross and 5,834 net.

During the fiscal year this company carried 81,803 passengers and 400,030 tons of freight, which is a decrease of 8,395 passengers and a decrease of 2,115 tons of freight as compared with the previous period.

The Oahu Shipping Co. operates a fleet of six motor vessels with a gross tonnage of 569 tons, two seagoing barges, and an oil vessel. During 1918 this company carried 66,670 tons of freight between island ports. No passengers are carried.

Steam railroads.

Islands.	Number.	Track.	Increase.	Gauge.	Rolling stock.		
					Locomotives.	Passenger cars.	Freight cars.
		Miles.		*Ft. in.*			
Oahu [1]	2	125.84	0.76	3 0	26	51	707
Hawaii	3	115.00	.....	3 0 4 8 3 0	16	18	264
Maui	1	42.11	.83	3 0	9	6	173
Kauai	1	19.22	.....	2 6	1	.....	29
Total	7	302.17	1.59	.....	52	75	1,173

Islands.	Freight carried.	Passengers carried.	Bonds outstanding.	Rate of interest.	Capital stock.
	Tons.			*Per cent.*	
Oahu	923,502	1,592,440	$2,000,000	5	$5,150,000
Hawaii	205,836	430,688	2,350,000	5	4,114,960
Maui	315,657	115,896	.....	.....	300,000
Kauai	13,854	.....	348,000	6	500,000
Total	1,458,849	2,139,024	4,698,000	.....	10,064,960

[1] Figures from Oahu on freight and passengers carried are for the Oahu Railway & Land Co. During the calendar year 1918 the Koolau Railway Co. carried 4,775 passengers and 22,347 tons of freight.

PRIVATE (PLANTATION) RAILWAYS.

Island.	Number.	Track.	Increase.	Locomotives.	Passenger cars.	Freight cars.
Oahu	9	201.00	3.25	33	18	2,792
Hawaii	11	111.54	.50	29	2	1,509
Maui	5	146.26	2.00	20	1	2,663
Kauai	10	208.76	.....	38	9	3,091
Total	35	667.56	5.75	120	30	10,055
Grand total	42	969.73	7.34	172	105	11,228

Street railroads.—The Honolulu Rapid Transit & Land Co. controls and operates the only street railway system in this Territory. It is an electric line, partly single and partly double track.

During the year the company expended for betterment of the system $95,411.47. Outstanding capital stock is $2,000,000. Gross income for the calendar year of 1918 was $735,151.14, an increase of $8,547.74 over that of the preceding year. Disbursements were $814,736.71, an increase of $14,744.93. The number of fare passengers was 14,304,489, a decrease of 73,603 from the previous year. The number of free passengers carried, principally policemen, letter carriers, firemen, and employees, was 177,219, a decrease of 14,083. School children are carried at half rate. The car mileage was 2,069,359.61.

Telegraphs and telephones.—In addition to the cable system across the Pacific Ocean which has been in operation a number of years,

there are three wireless plants, which are either wholly or in part operated by the Government. The Government has also operated the interisland wireless system of the Mutual Telephone Co. of Honolulu since the beginning of the war.

The sending station of the Marconi Wireless Co., which was taken over by the Government upon the day war was declared, was turned back on March 20, 1918, but is being held in readiness to be placed in operation upon short notice. The Marconi sending station at Koko Head was taken over by the Government on January 8, 1918. On August 1, 1919, the Government ceased to operate this station, but is still holding it. It is expected that with the ratification of the peace treaty the company will be put in full charge of both stations, which will then be operated on a duplex system.

The Mutual Telephone Co. operates the principal telephone system on the island of Oahu, and now has in operation 775 instruments, with 43 miles of conduit, 115 miles of cable, and 1,300 miles of open wire in Honolulu alone. Outside of the city it has 1,164 miles of copper wire, 1,675 miles of iron wire, and 777 instruments.

On the island of Hawaii the Hawaii Telephone Co. of Hilo operates 1,521 instruments, with 2,600 miles of open wire. The Kohala Telephone Co. on the same island operates 103 telephones, on 225 miles of wire, and will add 150 miles of wire and several telephones next September.

The Mutual Telephone Co. of Wailuku, Maui, operates 1,059 instruments with 1,812 miles of wire, and the Kauai Telephonic Co. of Lihue, Kauai, has 280 telephones and 495 miles of wire in operation.

Education.—During the year there were maintained 168 public schools, with 1,063 teachers and 36,102 pupils, an increase of 5.1 per cent over the previous year. The cost of general maintenance of schools during 1919 was $1,206,924.32, and the cost of new buildings was $167,910.49. The number of private schools was 61, having 370 teachers and a total attendance, male and female, of 7,169. The number of pupils of all races in public and private schools was 43,271, as against 41,644 for the year 1918.

At the beginning of the year nearly all of the men students at the College of Hawaii were enrolled in the Student Army Training Corps. After demobilization in December there were many readjustments; the military experience obtained by the students had much of an educational value. A course in sugar technology has been placed on a better basis by an arrangement under which students are enabled to work at the experiment station of the Hawaiian Sugar Planters' Association and at the factory at Kahuka. The total regis-

tration for the year was 145, of whom 68 were studying for degrees; by classes there were, graduates, 1; seniors, 5; juniors, 6; sophomores, 16; freshmen, 14. The geographical distribution of the students is as follows: Oahu, 118; Hawaii, 12; Kauai, 4; Maui, 6; Japan, 2; China, 1; California, 1; and Michigan, 1.

There are two industrial schools in the Territory, one for boys, situated at Waialee on the northern shore of the island of Oahu, and one for girls at Moiliili, a suburb of Honolulu. These institutions receive and care for all the juvenile delinquents who are not paroled and put on probation by the juvenile court in Honolulu or the circuit judges of the outside islands, who also act as juvenile judges. The instruction is chiefly of a vocational nature, and the children receive a portion of their earnings. There were 143 boys in the boys' school at the end of the fiscal year, having ages ranging from 8 to 20 years, and in the girls' school there were 114 girls. As a war measure the girls worked in a local pineapple cannery during the summer and with a part of the money thus earned bought a thousand-dollar Liberty bond.

In the Hawaiian Library the registration at the end of the year was 8,957, an increase of 760 over the previous year. The home use of books aggregated 115,518, greater by 7,641 than any previous period. Of those holding library cards, 54.2 were adults and 45.8 children. The number of visitors to the reading and reference rooms totaled 51,800, and the number of books in the library 41,860. Library instruction has been given to all grammar-school grades above the fourth, and the children taught the use of catalogues and ordinary reference books. There has been a notable gain in attendance of the children at the library. The islands department has increased its stations from 163 to 224, of which 57 are community libraries, 79 school libraries, and 88 home libraries. The library holds an important place as a social center, there being 291 meetings of various kinds held there during the year.

The indexing of the correspondence of the archives of Hawaii, which was discontinued in May of 1918, has been resumed and will be continued during the coming year. The indexing of important matters in the bound volumes of newspapers on file has been finished up to 1904. This index, which begins with 1836, has proven of great value, and information on a variety of subjects official and historical has been supplied.

There was compiled, by the librarian, a "Roster of the Legislature of Hawaii" from 1841 to and including the session of 1919. This book of 300 pages contains not only a list of members of the different sessions, but also the several constitutions of the Kingdom of Hawaii, and that of the Republic, the speeches of the monarchs from Kame-

hameha III to Liliuokalani, and of the President to the legislature, and an alphabetical list of members during the period mentioned, giving individual records. A historical sketch of the evolution of the legislature since the creation of a law-making body, by proclamation of the King in 1829, forms the preface. The work was published in February, 1919, as publication No. 1, of the archives of Hawaii, and given wide distribution both in Hawaii and on the mainland. It has met with a very favorable reception and has been highly commented on by a number of State and law librarians.

Work on the revision of the Hawaiian Dictionary was continued. Act 18, session laws of 1913, put this work under the direction of the archives commission. Act 123, session laws of 1919, provides that all future work shall be done by a commission of three persons, to be appointed by the governor upon the recommendation of the commissioners of public archives, said commissioners to continue the supervision of the work.

Legislature.—The principal business enacted by the legisuature at the session of 1919 was financial. Of the 242 acts approved, 94 involved money from the general fund. In addition the legislature enacted a loan bill providing for public improvements to the amount of $4,901,698, more than half of which is for wharf and harbor improvements. Concurrent resolutions were also adopted recommending that the governor set aside lands for nine public parks. Certain members of the 1919 legislature, by going back on their pledge to support woman suffrage, earned the ill will of a large majority of the people, and as a result the legislature received little credit for any good legislation. Following is a list of some of the measures enacted:

Act 15. To provide for a quarantine station in the city of Hilo.

Act 22. Permitting the practice of chiropractic.

Act 50. Providing for the issuance of $200,000 of bonds to build a breakwater at Nawiliwili, Kauai, the Federal Government to appropriate at least an equivalent amount.

Act 62. Amending the municipal act.

Act 63. Modifying the power of eminent domain as exercised by counties.

Act 73. Providing for training of nurses at the Queen's Hospital and issuing certificates to them.

Act 83. Giving further protection to forest reserves.

Act 97. Providing for an appropriation for the celebration of the centennial of the death of Kamehameha I.

Act 102. Making an appropriation to provide for the feeble-minded.

Act 107. Providing an increase in the pay of school-teachers.

Act 109. Relating to the storage of explosives.

Act 118. Making an appropriation to build a wharf at Kapaa, Kauai.

Act 121. Providing for a fish and game commission, to establish a fish hatchery and appropriating $25,000 for the use of the commission.

Act 129. To provide for the support of children of indigent, widowed, or abandoned mothers, and creating local boards to administer such support.

Act 131. For the establishment of a school for blind and other defective children.

Act 138. Providing for the acquisition of property at Nawiliwili, Kauai, for wharf and warehouse purposes.

Act 158. Amending the sinking fund act.

Act 186. Defining the crime of criminal syndicalism and providing punishment therefor.

Act 187. Making an appropriation to provide for calling a Pan-Pacific Congress in Honolulu, 1920–21.

Act 190. Providing for the purchase of the Irwin Beach property at Waikiki, to be made a part of Kapiolani Park.

Act. 203. Changing the College of Hawaii to a university.

Act 207. Consolidating all the laws providing for the issuance of public loans.

Act 212. Establishing a biological laboratory at the Kapiolani Park Aquarium and placing the College of Hawaii in charge.

Act 225. Farm loan act, with an appropriation of $100,000 for advances to homesteaders.

Act 227. Providing for the identification of automobiles belonging to the Territorial or county governments, so as to be used for official business only.

Act 229. Providing for the purchase of Washington Place, the former residence of Queen Liliuokalani, as an executive mansion.

Act 233. Regulating investment companies so as to provide against fraud in the sale of securities.

The legislature adopted a concurrent resolution providing for the appointment by the governor of a commission to have charge of the celebration in 1920, of the landing here of the first missionaries, March 31, 1820.

Following is a list of some of the more important resolutions passed:

House concurrent resolution 2. Requesting Congress to amend the Federal farm-loan act so as to include the Territory of Hawaii in its provisions.

House concurrent resolution 3. Requesting Congress to amend the organic act so as to allow the homesteading of larger areas of pastoral lands.

House concurrent resolution 4. Requesting Congress to appropriate funds for roads and water systems in homestead tracts and to assist homesteaders and farmers in the Territory of Hawaii.

House concurrent resolution 16. Requesting Congress to enact a law so as to allow half the customs and internal-revenue receipts collected in the Territory of Hawaii for 20 years from date of July 1, 1918, to be placed in a separate fund and expended only for public works in the Territory of Hawaii.

House concurrent resolution 28. Requesting Congress to amend the organic act in regard to homesteading.

House concurrent resolution 30. Asking that suspension of the coastwise shipping law, as applied to passenger traffic, remain in force until more American steamers are plying between Hawaii and the mainland of the United States.

Senate concurrent resolution 5. Requesting the right of statehood for the Territory of Hawaii.

Senate concurrent resolution 7. Requesting Congress to extend the benefits of the reclamation act to Hawaii.

Senate concurrent resolution 8. Favoring the enactment of a law whereby persons appointed to Federal positions in the Territory of Hawaii shall have resided for not less than one year in such Territory.

Senate concurrent resolution 11. Requesting an amendment to an act of Congress approved March 28, 1916, so as to authorize the Territorial board of harbor commissioners to make toll or tonnage charges on freight passing over wharves, etc.

Senate concurrent resolution 17. Requesting that the abandoned Federal Leprosarium at Kalawao, Molokai, be turned over to the Territorial board of health for the care and treatment of lepers.

Senate concurrent resolution 20. Directing the attorney general of the Territory of Hawaii to compile a list of, and a report upon, the cost incident to the acquisition by condemnation of all private fishing rights within the Territory of Hawaii.

Senate concurrent resolution 31. Providing for the appointment by the governor of a commission to investigate and report on the feasibility of establishing a free port or zone in the Territory of Hawaii.

Senate concurrent resolution 36. Authorizing and requesting the governor to appoint a commission to be known as the "Legislative Commission of the Territory," for the purpose of asssiting the Delegate to Congress by their presence in Washington in the presentation of measures to Congress.

ELEEMOSYNARY INSTITUTIONS.

ST. ELIZABETHS HOSPITAL.

Movements of population.—On June 30, 1919, there were remaining in the hospital 3,586 patients, as against 3,375 remaining June 30, 1918, an increase of 211 over the previous year. There were admitted during the year 1,802. The largest number of admissions to the hospital in any one year previous to this was 1,054. The total number of patients treated during the year was 5,177. The number of discharges, including deaths, was 1,591. The daily average population was 3,638, as against 3,330 for the year 1917–18, an increase of 308.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Remaining June 30, 1918	2,108	416	536	315	3,375
Admitted during year 1918–19	1,365	184	175	78	1,802
Total number under treatment during year ending June 30, 1919	3,473	600	711	393	5,177
Discharged:					
Recovered	373	33	34	12	452
Improved	247	14	29	10	300
Unimproved	134	23	28	10	195
Not insane	125	7	8	3	143
Died	333	63	70	35	501
Total discharged and died	1,212	140	169	70	1,591
Remaining June 30, 1919	2,261	460	542	323	3,586

The greatly increased number of patients for which the hospital had to care taxed its resources to the utmost, and during the course of the year additional construction was required. This consisted of nine buildings of a semipermanent character, consisting of a kitchen, a mess hall, and seven ward buildings, the whole group to accommodate 500 patients. In order that this group of buildings should be adequately assimilated with the rest of the hospital plant, a new boiler with automatic stoker was installed in the boiler house and an additional sewer line run to take care of the increased sewage.

Training school.—The entrance examination was held at the hospital October 5, 1918. Twenty-eight attendants entered the examination, 19 of whom passed and were admitted to the junior class. Three of these have resigned during the year; 3 have been discharged, and 6 failed in their mid-year examinations and class work. Two former pupils, with good records, were reinstated, making the junior class at present consist of 9 members. The senior class in the beginning consisted of 13 members. One has been discharged, leaving 12 in the class at the present time. A special course in dietetics was given the senior class by Mr. D. J. Sullivan, chef. Each member of the class received 10 hours' instruction. Tuesday and Friday mornings special demonstrations are held in the operating room. These include preparation of instruments, dressing solutions, etc. Four members of the class receive these instructions six weeks at a time. Each pupil nurse spends one month in the hydrotherapy department. A special course in massage is being given the senior class at the present time by the chief of the training school. Except for the acute shortage of help, the work has been progressing satisfactorily.

Hospital work.—During the year 2,229 cases were presented to the staff conference for consideration, of which 1,498 were presentations for the first time, and 731 had been previously under consideration. During the year nine major surgical operations were performed by the consulting staff in the hydrotherapeutic department. The average number of patients treated per month was 176. Of these, 137 were white, and 39 colored. In the dental department 1,317 received treatment at various times. In the eye, ear, nose, and throat department, 396 patients received treatment. One hundred and eleven cases were considered by the clinical psychiatrist. Besides the work on selected cases, several series of six lectures each were given to Army medical officers and a series of ward clinics. Lectures were also given before the New York Neurological Society and the Pennsylvania School for Social Service on aspects of psychotherapy. A large number of examinations of various characters were made in the laboratories for inclusion in clinical records, and for diagnosis and treatment.

In the photographic department, only routine work was done. One thousand and eighty-three photographs of patients were made, and 55 for general scientific and administrative purposes.

Industrial department.—The shortage of labor and the difficulty of getting supplies interfered to some extent with the work of the industrial department. At the present time the hospital with the cooperation of the Red Cross is undertaking vocational training and recreation for the benefit of patients. The proposed work consists of a classified systematic course of vocational training to aid patients in occupying themselves. This, it is believed, will not only enable the patient to become useful to himself, have a tendency to improve his condition, but prove of socializing value. While occupied, he will be less inclined to find fault with himself and others; be more satisfied with his condition and surroundings, and sooner reach that mental and physical state where he may be discharged from the hospital.

The work in the brush and broom shop, mattress shop, upholstering department, shoe manufactory and repair department, the manufacturing of straw hats and knit stockings, the tailor shop and sewing room providing the bed linen and house supplies of the institution has been regularly maintained, many patients being employed therein.

Welfare workers.—Representatives of the various welfare workers of the country have been accommodated at the institution. The Young Men's Christian Association has had its representatives continuously on duty assisting the service men of the institution. The Red Cross has had several representatives who have offered their services in helping look after the welfare and entertainment of patients and employees. The Knights of Columbus and the Jewish Welfare Association have likewise had representatives at the hospital assisting in looking after the welfare of patients as well as employees. Numerous volunteer workers have been continuously at the hospital, expending their services in entertainment and welfare work. A warm welcome has likewise been extended to these activities.

The institution has been the recipient among other things of many gifts from organizations and individuals throughout the country. These gifts include a player piano, victrolas, and other automatic musical contrivances; cigars, cigarettes, and tobacco; fruits, candies, newspapers, books, periodicals, and magazines. Patients have also been given entertainments in the shape of operas, musical comedies, vaudeville, and moving-picture shows, boxing and wrestling matches, base ball, and excursions, including various trips to the city in automobiles.

Hospital personnel.—During the period of the war the hospital suffered seriously as the result of the draft and also as the result of

industrial competition. Throughout this period the total force of the institution was reduced by some 300, which represented practically a decrease in the efficiency of the working force of the institution approximately 50 per cent, which came at a time when the duties and responsibilities imposed upon the hospital had increased by approximately 100 per cent. In the midst of this situation came the influenza epidemic, with 840 cases of illness, 171 of which were among the employees.

Some relief to the situation was brought about, requiring, however, the shouldering of some added burdens, by the ordering to the hospital from the Surgeon General's Office of the Army of groups of medical officers for special instruction in neurology and psychiatry, and also of groups of hospital corps men, both from the Army and the Navy for special instruction in nursing. While they were stationed at the hospital they rendered valuable service in assisting with the work of the institution, and the hospital gave such assistance in the way of instruction as its facilities, limited as they were at that time, were capable of. Following the signing of the armistice, the Army detailed a military detachment of 300 men, including officers, to help in doing the work of the hospital, and at the close of the year, when it appears that this detachment will shortly be removed, the problem of reconstruction of the hospital and its rehabilitation from the serious condition in which it had been projected by the war, was taken up by a special committee appointed by the Board of Visitors and a comprehensive plan elaborated. As a result of the report of this committee, a supplemental appropriation was requested of Congress with a view to raising the salaries of the medical and scientific staff and ward-service employees, making additions to the staff of various classes of medical and scientific offices, preparing new positions such as vocational director, director of recreation, dietitians, technicians, etc. Accordingly, Congress increased the appropriation for the hospital from $675,000 to $1,000,000, and authorized the Secretary of the Interior to adjust the compensation of officers and employees of the institution.

Change of method of appropriating for District of Columbia patients.—The report calls attention to the fact that:

> The present methods of making appropriations include certain items in the sundry civil bill for patients and the balance in the District of Columbia appropriation bill. Before the hospital has a right to use the amount in the District appropriation bill we must render a bill at the end of each month showing the amount of money that has been earned on account of the board and treatment of District patients, transmit this bill to the District for audit, and after it has been checked up and transmitted through the Treasury the money is then transferred to the hospital for use. During the last months of the fiscal year this handicapped the hospital to a great extent in the paying of its obligations. The hospital must use the appropriations for each year before the end of the fiscal year. The hospital can not secure the money to pay the bills

for supplies used during the year nor figure the exact amount of money it will receive from the District until after the termination of the fiscal year, and a bill is rendered showing the number of days in which the District patients have received food and treatment. On the one hand, we have an act of Congress saying that all money must be spent before the end of the fiscal year, and on the other that we can not secure the money to spend until after the termination of the fiscal year. This has embarrassed us very materially during the past few years. In order to relieve us somewhat, it has been the practice of the Commissioners of the District of Columbia to advance us from time to time previous to the end of the fiscal year such accounts as may have accrued to our benefit, due us on account of board and treatment prior to the rendering of the monthly bill. During the past fiscal year some of the accounting officers of the Treasury decided that this proceeding was irregular and must be discontinued. It is very desirable that Congress relieve us of this situation. This might be done by incorporating in the sundry civil bill the full amount needed by the hospital for all the Federal patients, including the patients of the District of Columbia, for board and treatment of their patients, the amounts we receive from them to be deposited to the credit of miscellaneous receipts of the general fund of the Treasury.

Bureau of War Risk Insurance patients.—The Attorney General, under date of April 14, 1919, held in effect that war risk patients are entitled to necessary hospital service under the war risk insurance act; that as the Secretary of the Treasury is the head of the department of which the Bureau of War Risk Insurance is a part, patients were properly admitted to the hospital upon the order of the Secretary of the Treasury; that the hospital service to which these patients were entitled is included in the purposes for which appropriations are made for the use of war-risk insurance and the cost thereof should be paid from said appropriations. He further held: "The only provision for a judicial inquiry into the mental status of any persons previous to their admission to the hospital (St. Elizabeths Hospital) is in the case of indigent persons residing in the District of Columbia. The war-risk insurance patient does not come within this class, and hence no such judicial inquiry is necessary in his case." The report calls attention to the fact that: "This opinion of the Attorney General seems to touch the basis of the contention in reference to so many of the patients admitted to this hospital from the Army and Navy, who, after their discharge from the Army or Navy, and those sent from the Soldiers' Home, complain that the superintendent has no authority to hold them without a judicial inquiry into their mental status."

New legislation and hospital needs.—In 1912 a committee consisting of Surg. Gen. George H. Torney, United States Army, representing the Secretary of War; Surg. A. W. Dunbar, representing the Secretary of the Navy; Mr. Robert V. La Dow, superintendent of prisons, representing the Attorney General; Maj. William J. Judson, Corps of Engineers, United States Army, representing the Commissioners of the District of Columbia; Mr. Scott C. Bone, repre-

senting the board of visitors of the Government Hospital for the Insane; and Dr. William A. White, superintendent of the Government Hospital for the Insane, representing the department, were, after consultation with the President, designated by the Secretary of the Interior to make a thorough investigation of the needs of the hospital and the future policy for its growth and development; their report was subsequently transmitted by the President to Congress for consideration. (S. Doc. No. 256, 62d Cong., 2d sess.) This report discusses very fully the needs of the hospital under four heads: (*a*) Defects in the laws governing the conduct of the institution and the commitment of patients. Under this head is included a draft of proposed legislation for commitment from the District of Columbia, along with certain changes in the legislation with reference to the transfer of Federal prisoners to the hospital. (*b*) The advisability of continuing in the hospital patients committed from the District of Columbia and from the Army and Navy and from distant points. Under this head is discussed the whole question of the future policy of the hospital with reference to the commitment of patients from distant points. (*c*) The policy to be adopted relating to the growth of the institution, and the matter of additional lands, buildings, equipment, etc. Here the question of administration, size of the institution, and its physical needs are discussed, together with a special report as to the care of the criminal insane. (*d*) The present conduct of the institution, including recommendations for improvement of the service and the advancement of the interests of the inmates. Under the third section the needs of the hospital are set forth.

During the first session of the Sixty-fourth Congress, Senate bill 6222 was introduced "To provide for admissions to the Government Hospital for the Insane, and for other purposes," drawn along the lines recommended in the above-mentioned report, and was referred to the Senate Committee on the District of Columbia. This bill has the approval of the department, as well as of the Commissioners of the District of Columbia, and should be enacted into law at the earliest practicable date. The recommendations contained in the above-mentioned report are commended to the further consideration of Congress.

FREEDMEN'S HOSPITAL.

Movement of the population.—There were received into the hospital during the year 3,852 patients, including births. These, with 218 remaining in the hospital from the preceding year, make a total of 4,070 indoor patients receiving care and treatment as against 3,892 for the previous year. Of those received, including births, 1,812 were indigent residents of the District of Columbia; 1,181 were indigent residents of the various States and Territories, and 959 paid for their treatment. There were discharged during the year 3,878

patients. Of this number, 1,836 had recovered, 1,350 improved, 252 unimproved, 84 not treated, and 350 died.

As regards the admission of patients, it is noticeable that there were 141 less indigent United States patients received than in the preceding year, 95 more from the District of Columbia, and 350 more pay patients. The growth of the pay-patient service has been marked. During the first year of this service, in 1913, there were 171 pay patients, and $3,229.50 received therefrom, while during the present fiscal year 959 pay patients were admitted, from whom were received $17,878. The surgical work was very heavy, 1,940 operations being performed, with the following results:

Recovered	1,374
Improved	463
Unimproved	20
Died	83

The medical service, on the whole, was satisfactory, notwithstanding the difficulties experienced during the influenza epidemic on account of the illness of many nurses.

In the dispensary, or out-patient department, 5,335 were treated as follows: Medical, 736; minor surgical, 812; neurological, 76; orthopedical, 169; pediatrical, 376; dermatological, 233; otorhinological, 818; urological, 361; gynecological, 729; ophthalmological, 965; and tuberculosis, 60.

Those attending these clinics made 9,940 revisits to the several divisions of this department, 2,548 being for surgical dressings. Contrary to expectations, there were treated in this department 2,919 less than the preceding year while there were 204 more received for indoor treatment. The increase of indoor patients was due to the increased number of pay patients. During the year there were many difficult situations, attended with unusual cares and anxieties. The absence of a large percentage of the members of the house and visiting staff on account of the war, the increased cost of all hospital supplies, the most unusual labor conditions, and the salary question made it exceedingly difficult at times in the administration of the hospital to maintain the high standard of efficiency so easily maintained in prior years. The work of the hospital, however, notwithstanding these trying conditions, has been kept to the standard of former years, due to the interested efforts and loyal cooperation of the house and visiting staffs.

War activities.—The normal function of the hospital to some extent was subordinated to the activities of the war.

Twenty-nine per cent of the members of the house and visiting staffs entered the military service, and 91 per cent of the internes enlisted in the Army. The pathological laboratory was used in the training of a few men for similar work in the Army. The wards

were open to the men receiving Army training in other institutions. The nursing department and members of the visiting staff conducted community training in first aid, and a member of the visiting staff with the surgeon in chief of the hospital served as members of the local exemption boards.

Hospital needs.—The surgeon in chief, in calling attention to the needs of the hospital, states that:

In the last annual report attention was drawn to several important items which had been urged in previous annual reports, but the necessities of war seemed to make it improper to press them very strongly at that time. These needs and others still exist, and now that the war is over, it appears proper that these items should be urged as never before, so that the ever-increasing and all-important work of this branch of the service may be kept not only to prewar efficiency, but that this institution shall not lag in providing means for postwar conditions.

First and foremost is the question of wages. Since no relief from higher living costs is to be seen, an increase in the basic salaries of all employees is most urgent. During the period of the war, it was possible to prevail upon some of the employees to remain in the service, through appeals made on patriotic grounds, though at a great personal sacrifice on their part. Now, that the war is over, appeals to patriotism can not be used to hold them. Some substantial inducement in the way of increased salaries must be offered. Especially should this be done for those who by reason of their special qualifications have made themselves almost indispensable. Those who fill the low-grade positions must be considered; if the cost of living bears heavily upon those holding the higher positions, it bears more heavily upon those filling the lower positions.

To meet this situation, an increase of $18,876 must be provided to raise the basic salaries of all employees to a proper level consistent with the changed conditions.

Ten thousand dollars increase for subsistence, fuel and light, medicine, and surgical supplies is as urgently needed as the preceding item. The abnormally high cost of all necessaries of life and all articles used for hospital work makes it quite certain that unless this amount is granted there will be a deficit at the end of the fiscal year 1920.

Fifteen thousand dollars for general repairs of the hospital should be provided and made immediately available. This amount is urgent and necessary to put the hospital in proper state of repair and sanitary condition. The inside walls are unsightly for the want of plaster, pointing up, and painting. Many of the down spouts and much of the plumbing must be replaced, and practically new roofs are needed for all buildings.

Five thousand dollars for new equipment is urgent, including operating tables, instruments, invalid chairs, bedside chairs, and wheel carts.

Sixty thousand dollars for a pathological building is also needed and should be provided without further delay, as being the only means for scientific study of disease.

Forty thousand dollars for a new ward for female venereal diseases.

Among the many important needs of the hospital to-day, none is more urgent than the construction of a new ward for the treatment and care of female syphilitics. Ample space is already provided for male patients of this class, but no provision has ever been made for females.

It was said during the war that as a military necessity it was urgent to combat venereal diseases to keep the soldier and sailor fit to fight. What was true then is equally true in times of peace. Society should meet and defeat these, the greatest of all foes to society, by making itself fit to live.

Twenty thousand dollars for enlarging the nurses' home, so as to provide ample room for more nurses, is needed. It is impossible for 48 pupil nurses to give a full measure of nursing service to all patients in a hospital with 278 beds; furthermore, no nurse should be kept on duty more than 8 hours in 24.

Twelve thousand dollars for fencing and beautifying the hospital grounds should be provided.

The force of employees should be supplemented by the addition of the following:

	Per annum.
A roentgenologist, at	$1,800
A dietitian, at	1,400
An assistant anæsthetist, at	1,000

The foregoing needs may seem pretentious to many unacquainted with the hospital situation, but all are urgent, and the sums of money requested as outlined therewith, if provided, would give the hospital ample facilities for greatly augmenting the character and standard of the work and make it possible to operate the same with the highest degree of efficiency.

Training school for nurses.—The training school for nurses at present provides a course of three years, and requires a high-school education as an essential for attendance. During the year, 140 applications were received, 22 applicants were taken on probation, 10 accepted for probation, 5 not accepted for probation, 3 resigned, 2 were dismissed, and 8 are on probation. There was more illness among the nurses than ever before, a total of 229 days being lost, principally being due to the influenza epidemic.

Special instructions in dietetics at Howard University were continued during the year; also a course on public-health nursing given by the District of Columbia League of Nursing Education at the Central Registry. Only two nurses could be spared to take the two months' practical experience course with the Instructive Visiting Nurse Society on infant welfare. Eight of the former graduates of the institution entered the military nurses' service, and were stationed at camps in Ohio. The graduating exercises were held May 6, 1919, in Andrew Rankin Memorial Chapel. Fifteen women graduated as nurses, making a total of 321 holding certificates from the school.

Pay patients.—In the act "making appropriations to provide for the expenses of the District of Columbia for the fiscal year ending June 30, 1913, and for other purposes," approved June 26, 1912, provision is made, under the head of "Medical charities," as follows:

Hereafter patients may be admitted to Freedmen's Hospital for care and treatment on the payment of such reasonable charges therefor as the Secretary of the Interior may prescribe. All money so collected shall be paid into the Treasury to the credit of Freedmen's Hospital, to be disbursed under the supervision of the Secretary of the Interior for subsistence, fuel and light, clothing, bedding, forage, medicine, medical and surgical supplies, surgical instruments, repairs, furniture, and other absolutely necessary expenses incident to the management of the hospital, a report as to the expenditure thereof to be made annually to Congress.

Under this provision 959 patients were received for treatment during the fiscal year 1919 as against 609 for the last year, the receipts therefrom amounting to $17,878.

Receipts and disbursements.

RECEIPTS.

Appropriation, sundry civil act:		
For support	$46,000.00	
Salaries	33,360.00	
		$79,360.00
Appropriations, District of Columbia (under contract with Board of Charities)		39,856.10
Pay patients		17,878.80
Total		137,094.90

DISBURSEMENTS.

Miscellaneous:	
Fuel, light, clothing, forage, medicine, etc	$41,993.90
Pay patients	7,785.75
Subsistence	43,665.22
Pay patients	5,488.14
Salaries	33,160.26
Pay patients	3,741.56
Refunds, pay patients	814.65
Total disbursements	136,649.48

Unexpended balances: Fuel, light, clothing, forage, medicine, etc., $6.10; pay patients, $48.70; subsistence, $190.88; salaries, $199.74; total, $445.42.

HOWARD UNIVERSITY.

The university was incorporated by the act of March 2, 1867 (14 Stat., 438). The object of the incorporation, named in the first section of the act, was "for the education of youth in liberal arts and sciences." It is declared that the incorporators shall be "a body politic and corporate, with perpetual succession." The management and control of the institution were vested in a board of not less than 13 trustees.

Students.—There were in attendance during the year 1,238 students from 37 States and 10 foreign countries. This number does not include 122 students who, by correspondence, took the work in the school of theology.

Students during year ended June 30, 1918.

College of arts and sciences	375
Teachers' college	86
School of manual arts and applied sciences	80
Conservatory of music	198
School of theology	42
School of medicine	252
School of law	48
Academy	197
Commercial college	93
Total	1,371
Names duplicated because of students taking special courses in different departments	133
	1,238
Correspondence students not counted above	122
Final total	1,360

One hundred and forty-six completed their studies in the university and were graduated as follows:

Graduates in 1919.

College of arts and sciences	42
Teachers' college	16
Normal course	2
Kindergarten course	2
School of theology	8
Medical college	19
Dental college	1
Pharmaceutic college	5
School of law	14
Academy	33
Commercial college	4
	146

War work.—A statement of the part taken by Howard University in the war has been published by the university and embodies a his-

tory of remarkable effort and achievement. Hundreds of colored officers proved their fitness and brought honor to their race, because the activities of the Howard men made possible the training camp at Des Moines. In all, 786 men were trained at the university, as follows:

National Army	520
Training camp for officers (instruction camp)	457
Students' Army Training Corps:	
Section A	388
Section B	421
Total	1,786

Reorganization.—The academic plan of the university has been carefully revised. All freshmen students for next year will enter junior college. Two years' work will be demanded before the student may go to the senior school of his choice. The courses in the junior college will fit him to enter the two-year schools of journalism, liberal arts, education, and physical education, or he may go to graduate schools of law, medicine, or theology. The school of applied sciences requires a full four years' course, while the courses in the school of music are to be taken in combination with the academic courses. Emphasis is laid upon the full four years' liberal arts course, but opportunity is given to specialize during the last two years, thereby fitting the student to go at once to his life's task, at the same time having his college degree. The discontinuance of all secondary work at the university gives greater opportunity for the regular college tasks.

Appropriations.—Although the institution was established in 1867, no appropriation was made by Congress for its support until March 3, 1879, when $10,000 was appropriated for "maintenance." From that date up to July 1, 1918, the date of approval of the last sundry civil act, Congress has appropriated for the university for various purposes, mostly current expenses, a total of $2,223,215.50.

All of the Government appropriations are expended by the Secretary of the Interior, who is a patron ex officio of the board of trustees.

Property.—The auditors for the institution, in a report dated September 15, 1919, give the total value of all property belonging to the university at the close of the fiscal year, June 30, 1919, as $1,851,036.06, of which $438,085.18 represents endowments, unproductive-land fund, cash in bank, etc. The remainder of the property belonging to the university, valued at $1,412,950.88, consists of the following: Land, $616,057.47; buildings, $620,057.52; and equipment, $166,835.89.

This large property has been accumulated mainly from donations and the sale and the increase in value of about 120 acres of

land originally purchased and subdivided by the university. The annual congressional appropriations have been mainly for the payment of salaries, the purchase of supplies, care of grounds, and other current expenses. Two buildings and a portion of the equipment have also been provided from Government appropriations.

COLUMBIA INSTITUTION FOR THE DEAF.

There were under instruction during the fiscal year ended June 30, 1919, in the advanced department of the institution, known as the Gallaudet College, 63 men and 43 women, a total of 106, representing the District of Columbia, Canada, and 32 States, a decrease of 8 as compared with the last year.

In the primary department, known as Kendall School, there were under instruction 23 boys and 28 girls, a total of 51; a decrease of 2 as compared with the preceding year. Of the total in this department, 36 were admitted as beneficiaries of the District of Columbia.

During the past year the number of free scholarships allowed in the advanced department was increased from 100 to 125. The number of students for the fiscal year to end June 30, 1920, it is believed will be the largest in the history of the institution, and there is reason to believe that all of these scholarships will be taken up in another year.

An epidemic of influenza visited the institution during the term. There were approximately 75 cases among the students and pupils. Several cases were severe, and one student in the preparatory class died. Considering the difficulties in obtaining nurses and the fact that a number of the employees were ill at the same time that students were suffering, the institution was fortunate in having but one fatality. The epidemic made necessary the dispensing of work of the collegiate department for a period of two weeks and the lengthening of the Christmas holidays of the primary department. This work, however, was made up during the year.

The course of instruction as reported last year was carried out with the additional requirement of drawing from preparatory students. A very large majority of the young women of the college have petitioned for the addition of instruction in domestic science, and in the estimates for the next fiscal year provision has been made for a teacher in that subject. By vote of the faculty the granting of other baccalaureate degrees than the bachelor of arts and bachelor of science will be abolished after the year 1920.

The total receipts of the year, including the balance of $1,987.48 at the beginning of the fiscal year, was $125,513.32. The total expenses were $124,029.69, leaving a cash balance on hand June 30, 1918, of $1,483.63.

The estimates of appropriations for the fiscal year ending June 30, 1921, were as follows:

For the support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements	$108,000
For repairs to buildings, including plumbing and steamfitting, and repairs to pavements within the grounds	10,000
For painting and equipping new women's dormitory building and finishing grading and walks adjacent thereto	7,000
For the purchase of 6.2 acres of land between Montello Road, West Virginia Avenue, and the northeast boundary of the grounds of the institution	12,000
For the purchase of an automobile truck	2,000

At the close of the school year the degree of master of arts was conferred on 1 graduate and the degree of bachelor of arts was conferred on 5 members of the graduating class. The degree of bachelor of philosophy was conferred on 5 members and certificates of graduation upon 2 members. Similar certificates were also granted to 3 normal students. The honorary degree of master of arts was conferred on Mr. Grover C. Farquhar of the class of 1913.

The department has no supervision over the expenditures of the appropriation made by Congress, or general supervision over the administration of the affairs of the Columbia Institution for the Deaf. The only duty devolving upon the Secretary of the Interior in relation to this institution at this time is the reception of the annual report thereof and the admission of indigent deaf mutes of the several States and Territories to that institution for instruction in the collegiate branch thereof. Legislation should be enacted by Congress placing the control and maintenance of the Columbia Institution for the Deaf under the president and board of directors thereof and requiring them to report directly to Congress as to the administration of the institution.

MARYLAND SCHOOL FOR THE BLIND.

Section 2 of the act of Congress, approved May 29, 1858 (11 Stat., 294), authorizes the Secretary of the Interior to place for instruction in an institution for the blind, in the State of Maryland or some other State, the indigent blind children of teachable age who are children of persons actually engaged in the military and naval service of the United States, and under section 4869, Revised Statutes of the United States, the blind children of teachable age belonging to the District of Columbia.

The act of May 26, 1908 (35 Stat., 295), making appropriations for the District of Columbia provided that after July 1, 1908, a contract should be entered into by the Commissioners of the District of Columbia for the instruction, in Maryland or some other State, of indigent blind children of the District, appropriated $6,000 for the pur-

pose, and repealed the permanent indefinite appropriation under section 3689 of the Revised Statutes. Inasmuch as the Secretary of the Interior, by section 2 of the act of May 29, 1858 (11 Stat., 293), was also charged with providing for the instruction of the blind children of all persons in the military and naval service of the United States while such persons are actually in such service, the expense to be defrayed from the permanent indefinite appropriation above referred to, the question was submitted to the Comptroller of the Treasury as to whether that appropriation was repealed so far as to be no longer available for the instruction of this class of beneficiaries. In an opinion rendered October 27, 1908, the Comptroller of the Treasury held that the act of May 26, 1908, supra, only repealed the provisions of section 3689 of the Revised Statutes to the extent that said section provides for the education of the blind children of the District of Columbia, and that the permanent indefinite appropriation in question is still available for instructing the blind children of all persons in the military and naval service of the United States in some institution in Maryland or some other State, and that the Secretary of the Interior is authorized to continue to issue permits for the instruction of such children. No permits for this class of beneficiaries were issued during the last year.

SUPERINTENDENT OF THE UNITED STATES CAPITOL BUILDING AND GROUNDS.

The Superintendent of the United States Capitol Building and Grounds states in his annual report that important changes and improvements in the heating and ventilating system have been inaugurated, including the installation of ventilating fans above the Senate cloakrooms and changes in the source of air handling and supply; considerable work in touching up and repainting different sections of the Capitol has been performed. A large number of minor repairs, difficult to enumerate, have been completed. Daily inspections of 11 elevators were made, as well as constant care given to all the mechanical equipment, including that of the two restaurants. The daily minor repairs, including the renewal of electric-light bulbs and the examination of electric small ventilating fans have been properly made.

Senate wing.—The walls of the Senate Chamber were painted and the ceilings cleaned. The painting in the Vice President's room was touched up; walls and woodwork in four committee rooms and six rooms occupied by Senators were painted, as well as the corridors of the Senate wing. Miscellaneous repairs included painting of the walls of the Senate restaurant, lobbies, and press gallery, the removal of partitions in the room of the Senate Committee on Immigration, installation of lavatory in the room of the Committee on

Cuban Relations, and the equipment of rooms in the Senate terrace with 35 pairs of iron-grating doors and transoms.

House wing.—In the chamber of the House of Representatives a cork-tile floor has been laid in the area fronting the desk of the Speaker and in the center and outside aisles of the chamber; the fireplaces in the lobbies repaired, the ceilings cleaned, the walls touched up, and the frames of the portraits of Washington and Lafayette regilded. Terrazzo floors have been laid in the principal offices of the Clerk of the House and a doorway cut to connect the adjacent rooms.

From the file room a partition has been removed to form an additional anteroom for the House Committee on Appropriations. In the heating and ventilating department machinery has been overhauled and new parts supplied as needed. The general painting and touching up includes cleaning and painting of seven committee rooms, eight office rooms in the House section of the center building, the Clerk's office, the room occupied by the bill clerk, the press gallery, the office of the doorkeeper, one of the rooms of the House library, room occupied by the page boys, and the painting of all elevator shafts and House corridors.

Fifteen emeralite desk fixtures have been installed in various offices of the House wing, 10 one-light crystal light brackets in the House Committee on Appropriations, and 72 electric light fixtures installed in various offices of the House wing.

Works of art in the Capitol.—Two accessions to the works of art have been received during the year. The State of Florida has installed in Statuary Hall a bronze statue of Gen. E. Kirby Smith, by C. A. Pillars, and a portrait in oil of former Speaker Hon. Champ Clark, the work of Boris B. Gordon, has been added to the collection of portraits of former Speakers in the lobby adjoining the Hall of the House of Representatives.

United States Capitol Grounds.—In addition to the general customary work on the Capitol Grounds, including the care of the lawns, walks, and drives, care of plant cases, trees, and shrubs, there have been 170 shrubs planted, 6 trees planted and 4 removed; 310 trees have been pruned of deadwood, dead cavities in 20 trees surgically treated, 475 yards of compost used as top dressing on the lawns, and 1,775 square yards of sod placed.

Pointing and repairs have been made to the balustrades and piers of the west front, and the walls of the grand staircase and to the fountain and basin of the west front. At the east front the fountains and four granite lamp-posts have been pointed and repaired.

Capitol power plant.—Continuous successful operation of the Capitol power plant has been maintained and needed repairs and replacements necessary to keep the equipment in effective service

have been attended to. During a portion of the time current has been supplied to the Interior Department Building, and, with the concurrence of the House Office Building Commission, current has been furnished to the group of buildings located between the Capitol and the Union Station and used as dormitories under the charge of the Housing Corporation.

Engine house, Senate and House stables.—For some months prior to January 1, 1919, the old No. 3 engine house was used as a salvage station of the American Red Cross.

The roof on the Senate stables has been replaced with a new roof, the plumbing overhauled and repaired, and additional electric wiring installed. All necessary repairs to the stables have been made.

Reconstruction, United States Courthouse.—Work at the courthouse is practically completed and its occupancy by the courts expected at an early date.

Architectural features of the exterior have been preserved, for the reason that it has always been considered one of the best examples of architectural beauty in the District of Columbia. The interior has been remodeled to meet the demands of the present time, and contains all modern improvements.

Columbia Hospital for Women and Lying-In Asylum.—During the year repairs have been made to doors and windows as needed, new shelving furnished for the storeroom, special equipment throughout the building overhauled and placed in effective condition, the heating plant repaired, a high-pressure steam line installed to sterilizers and utility rooms, and the indirect-heating system for the operating and delivery rooms remodeled.

New women's dormitory, Columbia Institution for the Deaf.—The work at this institution includes the construction of a 15-foot concrete driveway around the building, the construction of a large unloading platform, and the connection by concrete sidewalks of the driveway with various entrances to the building; the driveway is also connected with the Florida Avenue entrance to the grounds with a 12-foot macadamized roadway with stone curbs.

In the interior of the building the work comprises the installation of modern equipment for the gymnasium, the construction of lockers and shelving for two linen rooms, installation of glass shelves and towel racks in all rooms of the dormitories, the completion of the finishing and varnishing of woodwork in basement and first floor, painting of all corridors and the entrance hall, necessary adjustment of all doors and windows, the covering of all steam pipes with asbestos pipe covering, and the water pipes with thick wood felt pipe covering.

United States Botanic Garden.—Iron construction has been used in making repairs in the boiler room of the seed department where

a fire occurred last winter. An additional stairway in the center of this building has been erected.

A room used as a ladies' toilet has been remodeled, a cement floor laid, and new plumbing installed.

A new sectional boiler has been installed on the Maryland Avenue reservation, and new heating apparatus placed in greenhouse No. 7.

All necessary minor repairs have been made to the buildings and heating plants, 3,500 square feet of propagating benches erected, water coolers and fountains placed throughout the grounds, and delivery improved by the purchase of a motor-delivery truck at a cost of $758.50.

Enlarging the Capitol Grounds.—The act of August 26, 1912 (37 Stat., 594), imposes on the Secretary of the Interior the duty of renting until removed property acquired under the act of June 25, 1910 (36 Stat., 739), and supplementary acts for the enlargement of the Capitol Grounds. During the fiscal year 1919 no properties additional to those acquired during 1916 and prior years were secured. As to the properties in square 633, the title to which is in the United States, no action has yet been taken by the Superintendent of the Capitol Building and Grounds toward removing the buildings thereon, and they have accordingly been rented as far as practicable at nominal rates.

Paragraph (*e*), section 1, of the act of May 16, 1918, entitled "An act to authorize the President to provide housing for war needs," is as follows:

> (*e*) To take possession of, alter, repair, improve, and suitably arrange for living purposes, to be used under the terms of this act, all houses on square 633 except the Maltby Building, owned by the United States, together with any other houses in the District of Columbia owned by the Government and not now occupied. The President shall, in the construction of buildings in the District of Columbia, make use of any lands owned by the Government of the United States deemed by him to be suitable for the purpose and which have not heretofore been dedicated by act of Congress for specific buildings.

In October of 1918, on the request of the president of the United States Housing Corporation, acting for the Secretary of Labor, all of the houses in square 633, bounded by New Jersey Avenue, B and C Streets NW., were turned over to that corporation to be repaired for occupancy under the provisions of the above-mentioned act.

In March, 1919, the Housing Commission returned to this department all the buildings in square 633 above mentioned, and from the commission's report it appears that during the time the buildings were under its supervision there was collected as rents from said houses between October 2, 1918, and March 15, 1919, the sum of $986. Between March 5, and November 14, 1919, this department collected as rents from the houses in the square mentioned the sum of $2,050 which has been deposited in the Treasury to the credit of "Miscel-

laneous receipts," and as to which a special report will hereafter be submitted to Congress.

AMERICAN ANTIQUITIES.

The act of June 8, 1906, entitled "An act for the preservation of American antiquities," provides, among other things:

SEC. 3. That permits for the examination of ruins, the excavation of archæological sites, and the gathering of objects of antiquity upon the lands under their respective jurisdiction may be granted by the Secretaries of the Interior, Agriculture, and War to institutions which they may deem properly qualified to conduct such examination, excavation, or gathering, subject to such rules and regulations as they may prescribe: *Provided*, That the examinations, excavations, and gatherings are undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation in public museums.

SEC. 4. That the Secretaries of the departments aforesaid shall make and publish from time to time uniform rules and regulations for the purpose of carrying out the provisions of this act.

Archæological explorations.—The uniform rules and regulations promulgated by the Secretaries of the Interior, Agriculture, and War pursuant to the above-mentioned act, under date of December 28, 1906, provide (par. 3) that—

Permits for the excavation of ruins, the excavation of archæological sites, and the gathering of objects of antiquity will be granted by the respective Secretaries having jurisdiction to reputable museums, universities, colleges, or other recognized scientific or educational institutions, or to their duly authorized agents.

During the year 10 permits were granted for the examination, excavation, and gathering of specimens, as follows:

February 7, 1919 (renewal), to the American Museum of Natural History, New York, N. Y. (Dr. Clark Wissler, for Messrs. Hyde and Morris as the representatives of said museum), to conduct excavations and gather collections in the cliff ruins and other aboriginal remains on the public lands in Grand Gulch, San Juan County, Utah, during the field season of 1919; all collections to be deposited in the American Museum of Natural History.

February 7, 1919 (renewal), to the Carnegie Museum (Dr. W. J. Holland), Pittsburgh, Pa., to continue quarrying operations, conduct excavations, and gather such fossils and objects of scientific interest as desired within the Dinosaur National Monument, Utah; all work to be performed under the general supervision of the director of the Carnegie Museum.

May 10, 1919 (renewal), to the Museum of the American Indian (Heye Foundation; Mr. George G. Heye, director) during the field season of 1919, to conduct archæological excavations in and gather

collections from the ruined pueblo of Hawikuh, and the ruin known to the Zuñi Indians as Kechipauan on the mesa above their village of Ojo Caliente, about 3 miles from Hawikuh, both ruins being situated on the Zuñi Indian Reservation in western New Mexico; collections to be deposited in the Museum of the American Indian (Heye Foundation), New York, N. Y.; this permit not exclusive and not to conflict with any work undertaken by the United States National Museum.

May 12, 1919, to Dr. Walter Hough, curator of ethnology, United States National Museum, Smithsonian Institution, to conduct during the field season of 1919 archæological explorations and gather collections in the White Mountain Apache Reservation, Ariz., investigating ruins at Cedar Creek, Cibecue, Blue Mountain, Grasshopper Valley, and Oak Creek, and westward into Tonto Basin, Ariz.; gatherings to be deposited in a manner agreeable to the Smithsonian Institution.

May 16, 1919, to the United States National Museum, acting through Mr. Neil M. Judd, curator of archæology, to conduct archæological reconnoissance of that portion of Arizona north of the Rio Colorado, and that portion of Utah lying within Kane and Garfield Counties, during the field season of 1919, and to conduct excavations and gather collections of specimens, etc., on the public domain and any Indian reservations in said territory; gatherings to be deposited in a manner agreeable to the Smithsonian Institution; this permit does not include any forest reserves or State lands.

May 28, 1919, to Dr. R. B. von Kleinsmid, president of the University of Arizona, on behalf of the University of Arizona, to conduct during the field season of 1919 archæological excavations in, and to gather collections from, the two pueblos located southwest of Navajo Mountain, near its base, and any cave ruins that may be found in the vicinity, the work to be conducted under the personal supervision of Prof. Byron Cummings, director of the Arizona State Museum, and any materials obtained to be deposited in said museum.

June 16, 1919, to the American Museum of Natural History, New York, N. Y. (Dr. Clark Wissler), to conduct archæological investigations at the Pueblo Bonito site within the limits of the Chaco Canyon National Monument, N. Mex.; to remove short sections from some of the timbers in the ruin and to make a few minor excavations in some of the rooms to check up data secured on the so-called Hyde expedition, provided that the excavations are made in such manner that there will be no further destruction of the standing walls, that the greatest care is exercised in the removal of any timbers which would lead to the weakening of adjacent walls, and that the privileges granted are confined strictly to the purposes outlined; the work to be under the immediate direction of Mr. Earl H. Morris, accompanied by Dr. Clark Wissler and Prof. A. E. Douglass, who

proposes to make a special study of the tree rings in timbers of the ruin with a view to determining their relative ages, etc.

June 25, 1919 (amended July 22, 1919), to the School of American Research, Santa Fe, N. Mex., Dr. Edgar L. Hewett, director; three-year exclusive permit from June 25, 1919, to conduct archæological excavations within the boundaries of the Gran Quivira National Monument, N. Mex., provided that the excavations are made in such manner that there will be no further destruction of buildings and that sufficient money will be expended to insure the preservation of walls; gatherings to be deposited in the United States National Museum, Washington, D. C., and the Museum of the State of New Mexico at Santa Fe; the expedition to be under the control of a commission consisting of Mr. William H. Holmes, of the United States National Museum; Dr. Mitchell Carroll, of the Washington Society of theArchæological Institute of America; and Mr. Otto T. Mallory, of the same society.

July 15, 1919, to Prof. Levi Edgar Young, for the University of Utah, work to be performed under the personal direction of Mr. Andrew Kerr, of Harvard University (now associated with the University of Utah), to conduct archæological investigations and make excavations of ruins 7 miles up Arunuweap Canyon from the junction of Zion Creek and Virgin River, Washington County, Utah, and also to make excavations in the Cottonwood Canyon, 7 miles from Kanab, Utah, west and south from Rigby Ranch, subject to the prior right of the Smithsonian Institution, represented by Mr. Neil M. Judd, of the United States National Museum, to which permit was granted May 16, 1919, covering in part that portion of Utah lying within Kane and Garfield Counties.

October 24, 1919, to Dr. Henry L. Ward, director, Public Museum of the city of Milwaukee, or his authorized agent, Mr. Arthur J. Ivens, to collect cliff dwellers' and pueblo remains and specimens in the area between Flagstaff, Ariz., and Marysvale, Utah, between October 27, 1919, and June 30, 1920, such collections to be deposited in the Public Museum of the city of Milwaukee.

On October 16, 1919, with the approval of the department, the following warning, to be posted on and in the vicinity of ruins located on public lands, was issued by the Commissioner of the General Land Office, to wit:

WARNING.

THIS ANCIENT RUIN IS LOCATED ON PUBLIC LAND.
IT BELONGS TO YOU—HELP PROTECT IT.

All persons are warned that it is unlawful to remove any object from, excavate upon, damage, destroy, or remove any portion of an ancient ruin located on lands owned and controlled by the Government of the United States, except under permit issued in accordance with the act of Congress, approved June 8, 1906 (34 Stat., 225); that any person violating this law may be arrested

by an officer of the United States, and may be fined not more than $500 or imprisoned for not more than 90 days, or may suffer both fine and imprisonment, in the discretion of the court. Help preserve for the future the records of the past.

GENERAL EDUCATION BOARD.

This corporation, which was created by the act of Congress approved January 12, 1903, section 6 of which requires the corporation to annually file with the Secretary of the Interior a report, in writing, stating in detail the property, real and personal, held by the corporation, and the expenditure or other use or disposition of the same or the income thereof during the preceding year, has for its object the promotion of education within the United States. The corporation owns no real estate, its property consisting of securities and money divided into various funds, according to the purpose for which it is to be used.

On June 30, 1919, the principal funds belonging without restriction to the board amounted to $34,176,110.01, invested in stocks and bonds.

The income from the above funds, together with the income from undisbursed income, amounted during the year to $2,982,210.08. The balance of income from previous year as of June 30, 1918, amounting to $8,074,037.92, together with a gift from Mr. John D. Rockefeller from his special fund, amounting to $349,746.91, increased the total amount available for disbursement to $11,405,994.91.

Disbursements from income during the year were as follows:

Universities and colleges for whites, for endowment	$564,910.96
Colleges and schools for whites, for current expenses	12,500.00
Professors of secondary education	35,634.70
Rural school agents, white	60,257.55
Lincoln School	115,000.00
Colleges and schools for negroes	170,535.00
Meharry Medical School (Negro)	7,500.00
Rural school agents for negroes	47,988.77
Summer schools for negroes	9,570.00
County training schools for negroes	18,711.28
Home-makers' clubs for negroes	35,481.08
Expenses of special students at summer schools	12,727.14
Negro rural school fund	20,000.00
John F. Slater fund	3,000.00
Association of colleges for negro youths	500.00
Maine agricultural demonstration work	24,284.47
New Hampshire demonstration work	16,600.00
Educational investigation and research	18,053.69
General survey of educational conditions and needs in North Carolina	2,081.31
General survey of educational conditions and needs in Virginia	8,046.35
Survey of mental measurements of school children	3,575.87
Expenses rural school agents at Harvard summer school	7,662.37
Model county organization	9,959.00

Conferences	$4,485.66
University of Chicago (interest)	27,157.51
Yale University (interest)	21,858.75
Lafayette College (interest)	515.44
Administration expense	136,359.32
	1,394,347.22

This leaves an undisbursed balance of income on June 30, 1919, of $10,011,647.69. It is invested as follows: Bonds and stocks, $9,204,190.60; cash, $774,479.85; accounts receivable, $32,977.24.

It should be noted, however, that against this balance there are unpaid appropriations amounting to $9,381,338.72.

The John D. Rockefeller special fund, mentioned in previous reports, is now completely used. The special fund derived its income from that portion of the funds set aside for the University of Chicago which remains undelivered, together with income from undisbursed income. On August 22, 1919, Mr. John D. Rockefeller surrendered his control over this fund, giving to the board the balance carried forward June 30, 1918, of $264,955.31 and income received and to be received, which amounted during the year to $84,791.60.

The Anna T. Jeanes fund, the income to be used for Negro rural schools, amounts to $200,000. It is invested as follows: Bonds, $164,355; stocks, $35,645.

The income from this fund during the year was $10,141.95. Added to the balance from the previous year, the total available income amounted to $16,780.26. Of this, $10,353.01 was appropriated and paid to various schools, and $28.83 paid out for expenses, leaving a balance of $6,398.42 in cash.

MARITIME CANAL CO. OF NICARAGUA.

Section 6 of the act of Congress approved February 20, 1889, entitled "An act to incorporate the Maritime Canal Co. of Nicaragua" (25 Stat., 675), provides:

> Said company shall make a report on the first Monday of December in each year to the Secretary of the Interior, which shall be duly verified on oath by the president and secretary thereof, giving such detailed statements of its affairs and of its assets and liabilities as may be required by the Secretary of the Interior, and any willfully false statements so made shall be deemed perjury and punishable as such. And it shall be the duty of the Secretary of the Interior to require such annual statement and to prescribe the form thereof and the particulars to be given thereby.

The report of this corporation when received will be duly transmitted to Congress. In view of the fact, however, that the Maritime Canal Co. of Nicaragua has no relations whatever with this department and the secretary has no duty to perform in relation thereto, except as specified in the above-mentioned law, the act should be so amended as to require the corporation to submit directly to Congress such form of report as it may prescribe.

APPENDIX A.

LAND CLASSIFICATION.

Land classification, with progress of coal classification and valuation.

STATUS ON JULY 1, 1918.

State.	Withdrawals outstanding.	Coal lands classified and appraised.	Valuation.	Valuation at minimum price.
	Acres.	*Acres.*		
Arkansas		60,715	$1,473,762	$1,214,280
Arizona	141,945			
California	17,643	7,720	585,086	154,404
Colorado	4,498,376	2,881,374	195,522,340	51,483,754
Idaho	4,761	4,603	89,624	79,060
Montana	10,612,112	5,782,216	137,365,396	121,469,318
Nevada	83,833	5,880	117,600	117,600
New Mexico	5,586,244	665,565	16,349,351	8,029,868
North Dakota	14,232,561	11,409,789	199,382,666	203,518,259
Oregon	4,361	7,195	128,051	95,299
South Dakota		244,874	2,711,462	2,711,462
Utah	5,314,075	1,069,631	45,088,853	14,560,647
Washington	824,074	1,866	38,526	37,320
Wyoming	2,437,563	7,238,515	387,802,633	108,386,785
Total	43,757,488	29,379,943	986,655,344	511,858,056

STATUS ON JULY 1, 1919.

Arkansas		60,715	1,473,762	1,214,280
Arizona	141,945			
California	17,643	7,720	585,086	154,404
Colorado	4,500,511	2,881,494	195,531,620	51,486,154
Idaho	4,761	4,603	89,624	79,060
Montana	10,612,032	5,783,336	137,410,916	121,654,418
Nevada	83,833	6,803	126,830	117,600
New Mexico	5,585,208	666,205	16,392,111	8,035,468
North Dakota	10,902,615	11,409,769	199,382,266	203,519,859
Oregon	4,361	7,195	174,843	117,729
South Dakota		244,874	2,711,462	2,711,462
Utah	5,313,836	1,069,871	45,101,333	14,565,447
Washington	824,074	1,866	38,520	37,320
Wyoming	2,437,723	7,238,635	387,820,153	108,389,185
Total	40,428,542	29,383,086	986,828,526	512,082,386

Withdrawals and restorations.

OIL LAND.

State.	Withdrawals outstanding July 1, 1918.	Fiscal year ended June 30, 1919.		Withdrawals outstanding July 1, 1919.
		Withdrawals	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	230,400			230,400
California	1,257,229			1,257,229
Colorado	87,474	135,503		222,977
Louisiana	467,030			467,030
Montana	[1] 1,351,891			[1] 1,351,891
North Dakota	84,894			84,894
Utah	1,962,787			1,962,787
Wyoming	1,083,900	98,657	931	1,181,626
Total	6,525,605	234,160	931	6,758,834

PHOSPHATE LAND.

Florida	119,737			119,737
Idaho	1,015,717			1,015,717
Montana	287,883			287,883
Utah	302,465			302,465
Wyoming	998,592			998,592
Total	2,724,394			2,724,394

POTASH LAND.

California	91,207		600	90,607
Nevada	39,422			39,422
Total	130,629		600	130,029

MINERAL LAND.

Arizona	8,507			8,507

OIL SHALE LAND.

Colorado	45,440		3,880	41,560
Nevada		650	527	123
Utah	86,584			86,584
Total	132,024	650	4,407	128,267

[1] This item is 5,786 acres greater than was given in report for the preceeding fiscal year. The discrepancy is the result of an error in computing the acreage of a withdrawal in Montana made and reported during the last fiscal year. The withdrawn area in Montana outstanding June 30, 1918, should have been reported as here given.

Metalliferous classification.

(Northern Pacific Railroad grant lands, Idaho and Montana.)

	Classified prior to July 1, 1918.	Classified June 30, 1919
	Acres.	*Acres.*
Mineral	224,218	224,218
Nonmineral	334,794	334,794
Total	559,012	559,012

Miscellaneous classifications.

[Lands chiefly in present and former Indian reservations.]

	Classified prior to July 1, 1918.	Classified June 30, 1919.
MINERAL AND NONMINERAL LAND.	*Acres.*	*Acres.*
Mineral	189,172	189,172
Nonmineral	7,394,331	7,394,331
Total	7,583,503	7,583,503
OIL LAND.		
Montana	42,097	42,097
PHOSPHATE LAND.		
Idaho	4,080	4,080
Wyoming	20,576	20,576
Total	24,656	24,656

Oil shale classification.

State.	Classified prior to July 1, 1918.		Classified during fiscal year 1918–19.		Classified June 30, 1919.	
	Mineral.	Nonmineral.	Mineral.	Nonmineral.	Mineral.	Nonmineral.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Colorado	896,018		56,221	4,080	952,239	4,080
Utah	2,635,915	4,744	69,120		2,705,035	4,744
Wyoming	460,103				460,103	
Total	3,992,036	4,744	125,341	4,080	4,117,377	8,824

Power sites withdrawn, restored to entry, and outstanding, fiscal year 1918–19, in acres.

State.	Withdrawals outstanding July 1, 1918.	Fiscal year ended June 30, 1919.		Withdrawals outstanding July 1, 1919.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Alabama	120			120
Alaska	81,015			81,015
Arkansas	22,354			22,354
Arizona	300,368	701	5,221	295,848
California	277,223	11,749	78	288,894
Colorado	276,514	622		277,136
Idaho	265,467		6,994	258,473
Michigan	1,240			1,240
Minnesota	12,309			12,309
Montana	164,412	27	8	164,431
Nevada	27,361	182		27,543
Nebraska	761			761
New Mexico	62,602			62,602
Oregon	421,972	1,760	988	422,744
Utah	447,628	2,351	1,281	448,698
Washington	113,533		285	113,248
Wyoming	89,493		1,182	88,311
Total	2,564,372	17,392	16,037	2,565,727

Public-water reserves.

State.	Withdrawals outstanding July 1, 1918.	Fiscal year ended June 30, 1919.		Withdrawals outstanding July 1, 1919.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	13,066	1,080	320	13,826
California	52,474	3,560	.....	56,034
Colorado	480	1,460	40	1,900
Idaho	7,210	.....	170	7,040
Montana	5,264	2,065	45	7,284
Nevada	4,753	80	.....	4,833
New Mexico	2,926	475	40	3,361
Oregon	2,482	9,262	.....	11,744
Utah	34,627	240	.....	34,867
South Dakota	.....	240	.....	240
Washington	40	760	.....	800
Wyoming	81,312	3,200	760	83,752
Total	204,634	22,422	1,375	225,681

Reservoir-site reserves.

State.	Withdrawals outstanding July 1, 1918.	Fiscal year ended June 30, 1919.		Withdrawals outstanding July 1, 1919.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	23,040	.....	.....	23,040
Colorado	1,728	.....	.....	1,728
Montana	9,080	.....	.....	9,080
North Dakota	1,569	.....	.....	1,569
Oregon	10,619	.....	.....	10,619
Washington	35,943	.....	.....	35,943
Total	81,979	.....	.....	81,979

Summary of enlarged homestead designations.

State.	Outstanding on July 1, 1918.	Designations during fiscal year 1918–19.	Cancellations during fiscal year 1918–19.	Outstanding on June 30, 1919.
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	25,467,643	21,840	.....	25,489,483
California	7,557,873	857,368	.....	8,415,241
Colorado	27,864,474	914,525	640	28,778,359
Idaho:				
Secs. 1, 5, and 7	10,062,974	259,925	3,400	10,319,499
Sec. 6	512,837	3,400	.....	516,237
Total	10,575,811	263,325	3,400	10,835,736
Kansas	509,834	38,920	.....	548,754
Montana	50,378,065	287,961	120	50,665,906
Nevada	46,304,756	.....	.....	46,304,756
New Mexico	29,988,434	1,531,555	.....	31,519,989
North Dakota	11,631,385	279,986	654	11,910,717
Oregon	18,150,919	788,508	440	18,938,987
South Dakota	15,648,876	252,884	.....	15,901,760
Utah:				
Secs. 1, 5, and 7	7,501,820	182,375	.....	7,684,195
Sec. 6	1,424,274	.....	.....	1,424,274
Total	8,926,094	182,375	.....	9,108,469
Washington	5,563,938	2,720	.....	5,566,658
Wyoming	21,781,756	3,030,670	.....	24,812,426
Total	289,349,858	8,452,637	5,254	288,797,241

Summary of stock-raising homestead designations, fiscal year 1918–19.

State.	Outstanding on July 1, 1918.	Designations during fiscal year 1918–19.	Cancellations during fiscal year 1918–19.	Outstanding on June 30, 1919.
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona		291,120		291,120
Arkansas		240		240
California		365,380		365,380
Colorado	1,432,766	1,250,398	8,200	2,674,964
Idaho		445,389		445,389
Kansas	15,384	42,220		57,604
Montana	55,538	2,346,252		2,401,790
Nebraska	38,648			38,648
Nevada		28,980		28,980
New Mexico	2,188,698	2,894,392		5,083,090
North Dakota	190,797	621		191,418
Oklahoma		22,481		22,481
Oregon		1,041,027	120	1,040,907
South Dakota	1,156,229	626,296		1,782,525
Utah		52,410		52,410
Washington		207,536		207,536
Wyoming	2,460,902	3,036,484		5,497,386
Total	7,538,962	12,651,226	8,320	20,181,868

APPENDIX B.

National parks administered by the National Park Service—National park statistics.

[Number, 18; total area, 10,739.5 square miles; chronologically in order of creation.]

Name.	Location.	When established.	Area in square miles.	Distinctive characteristics.
*Hot Springs..... 1832	Middle Arkansas.	Apr. 20, 1832	1½	46 hot springs possessing curative properties—Many hotels and boarding houses—20 bathhouses under public control.
*Yellowstone..... 1872	Northwestern Wyoming, southwestern Montana, and northeastern Idaho.	Mar. 1, 1872	[1] 3,348	More geysers than in all rest of world together—Boiling springs—Mud volcanoes—Petrified forests—Grand Canyon of the Yellowstone, remarkable for gorgeous coloring—Large lakes—Many large streams and waterfalls—Vast wilderness, greatest wild bird and animal preserve in the world—Exceptional trout fishing.
*Sequoia..... 1890	Middle eastern California.	Sept. 25, 1890	252	The Big Tree National Park—12,000 sequoia trees over 10 feet in diameter, some 25 to 36 feet in diameter—Towering mountain ranges—Startling precipices—Cave of considerable size.
*Yosemite..... 1890	.....do.....	Oct. 1, 1890	1,125	Valley of world-famed beauty—Lofty cliffs—Romantic vistas—Many waterfalls of extraordinary height—3 groves of big trees—High Sierra—Waterwheel falls—Good trout fishing.
*General Grant... 1890	.....do.....	.....do.....	4	Created to preserve the celebrated General Grant Tree, 35 feet in diameter—6 miles from Sequoia National Park.
*Mount Rainier... 1899	West central Washington.	Mar. 2, 1899	324	Largest accessible single peak glacier system—28 glaciers, some of large size—48 square miles of glacier, 50 to 500 feet thick—Wonderful subalpine wild flower fields.
*Crater Lake..... 1902	Southwestern Oregon.	May 22, 1902	249	Lake of extraordinary blue in crater of extinct volcano—Sides 1,000 feet high—Interesting lava formation—Fine fishing.
Wind Cave..... 1903	South Dakota.	Jan. 9, 1903	17	Cavern having many miles of galleries and numerous chambers containing peculiar formations.
Platt..... 1904	Southern Oklahoma.	July 1, 1902 Apr. 21, 1904	1½	Many sulphur and other springs possessing medicinal value.
Sullys Hill..... 1904	North Dakota.	Apr. 27, 1904	1¼	Small park with woods, streams, and a lake—Is an important wild animal preserve.
*Mesa Verde..... 1906	Southwestern Colorado.	June 29, 1906 †June 30, 1913	77	Most notable and best preserved prehistoric cliff dwellings in United States, if not in the world.
*Glacier..... 1910	Northwestern Montana.	May 11, 1910	1,534	Rugged mountain region of unsurpassed Alpine character—250 glacier-fed lakes of romantic beauty—60 small glaciers—Precipices thousands of feet deep—Almost sensational scenery of marked individuality—Fine trout fishing.
*Rocky Mountain. 1915	North middle Colorado.	Jan. 26, 1915 †Feb. 14, 1917	397½	Heart of the Rockies—Snowy range, peaks 11,000 to 14,250 feet altitude—Remarkable records of glacial period.
Hawaii..... 1916	Hawaii.....	Aug. 1, 1916	118	Three separate areas—Kilauea and Mauna Loa on Hawaii; Haleakala on Maui.
*Lassen Volcanic.. 1916	Northern California.	Aug. 9, 1916	124	Only active volcano in United States proper—Lassen Peak 10,465 feet—Cinder Cone 6,879 feet—Hot Springs—Mud geysers.
Mount McKinley. 1917	South central Alaska.	Feb. 26, 1917	2,200	Highest mountain in North America—Rises higher above surrounding country than any other mountain in the world.
Grand Canyon.... 1919	North central Arizona.	Feb. 26, 1919	958	The greatest example of erosion and the most sublime spectacle in the world.
*Lafayette..... 1919	Maine coast...	...do.....	8	The group of granite mountains upon Mount Desert Island.

[1] In Wyoming, 3,114 square miles; in Montana, 198 square miles; in Idaho, 36 square miles.
* General information circulars on these parks may be obtained free on application.
† Boundary changed.

National monuments administered by the National Park Service.

[Number, 23; total area, 1,931.6 square miles; chronologically in order of creation.]

Name.	Location.	Date of proclamations.	Area (acres).	Description.
Devils Tower	Wyoming	Sept. 24, 1906	1,152	Remarkable natural rock tower, of volcanic origin, 1,200 feet in height.
Montezuma Castle	Arizona	Dec. 8, 1906	[1] 160	Prehistoric cliff-dwelling ruin of unusual size situated in a niche in face of a vertical cliff. Of scenic and ethnological interest.
El Morro	New Mexico	do June 18, 1917	240	Enormous sandstone rock eroded in form of a castle upon which inscriptions have been placed by early Spanish explorers. Contains cliff-dweller ruins. Of great historic, scenic, and ethnologic interest.
Petrified Forest	Arizona	Dec. 8, 1906 July 31, 1911	25,625	Abundance of petrified coniferous trees, one of which forms a small natural bridge. Is of great scientific interest.
Chaco Canyon	New Mexico	Mar. 11, 1907	[1] 20,629	Numerous cliff-dweller ruins, including communal houses, in good condition, and but little excavated.
Muir Woods [2]	California	Jan. 9, 1908	295	One of the most noted redwood groves in California, and was donated by Hon. William Kent, Member of Congress. Located 7 miles from San Francisco.
Pinnacles	do	Jan. 16, 1908	2,080	Many spirelike rock formations, 600 to 1,000 feet high, visible many miles; also numerous caves and other formations.
Natural bridges	Utah	Apr. 16, 1908 Sept. 25, 1909 Feb. 11, 1916	[1] 2,740	Three natural bridges, among largest examples of their kind. Largest bridge is 222 feet high, 65 feet thick at top of arch; arch is 28 feet wide; span, 261 feet; height of span, 157 feet. Other two slightly smaller.
Lewis and Clark Cavern. [2]	Montana	May 11, 1908 May 16, 1911	160	Immense limestone cavern of great scientific interest, magnificently decorated with stalactite formations. Now closed to public because of depredations by vandals.
Tumacacori	Arizona	Sept. 15, 1908	10	Ruin of Franciscan mission dating from sixteenth century, until recent years in fair preservation, now rapidly disintegrating.
Navajo	do	Mar. 20, 1909 Mar. 14, 1912	360	Contains numerous pueblo, or cliff-dweller ruins, in good preservation.
Zion	Utah	July 31, 1909 Mar. 18, 1918	76,800	Magnificant gorge, depth from 800 to 2,000 feet, with precipitous walls of gorgeous coloring. Of great beauty and scenic interest.
Shoshone Cavern	Wyoming	Sept. 21, 1909	210	Cavern of considerable extent, near Cody.
Gran Quivira	New Mexico	Nov. 1, 1909	[1] 160	One of the most important of earliest Spanish mission ruins in the Southwest. Monument also contains pueblo ruins.
Sitka	Alaska	Mar. 23, 1910	[1] 57	Park of great natural beauty and historic interest as scene of massacre of Russians by Indians. Contains 16 totem poles of best native workmanship.
Rainbow Bridge	Utah	May 30, 1910	160	Unique natural bridge of great scientific interest and symmetry. Height 309 feet above water, and span is 278 feet, in shape of rainbow.
Colorado	Colorado	May 24, 1911	13,883	Many lofty monoliths, and is wonderful example of erosion, and of great scenic beauty and interest.
Papago Saguaro	Arizona	Jan. 31, 1914	2,050	Splendid collection of charactistic desert flora and numerous pictographs. Interesting rock formations.
Dinosaur	Utah	Oct. 4, 1915	80	Deposits of fossil remains of prehistoric animal life of great scientific interest.
Capulin Mountain	New Mexico	Aug. 9, 1916	681	Cinder cone of geologically recent formation.
Verendrye	North Dakota	June 29, 1917	253	Includes Crowhigh Butte, from which Explorer Verendrye first beheld territory beyond the Missouri River.
Casa Grande	Arizona	Mar. 2, 1889 [3] Dec. 10, 1909 Aug. 3, 1918	480	These ruins are one of the most noteworthy relics of a prehistoric age and people within the limits of the United States. Discovered in ruinous condition in 1694.
Katmai	Alaska	Sept. 24, 1918	[1] 1,088,000	Wonderland of great scientific interest in the study of volcanism. Phenomena exist upon a scale of great magnitude. Includes Valley of Ten Thousand Smokes.

[1] Estimated.
[2] Donated to the United States.
[3] From Mar. 2, 1889, until Aug. 3, 1918, classified as a national park.

National monuments administered by the Department of Agriculture.

[Number, 10; total area, 509.5 square miles; chronologically in order of creation.]

Name.	Location.	Date of creation.	Area (acres).	Description.
Gila Cliff Dwellings.	New Mexico...	Nov. 16, 1907	160	Numerous cliff-dweller ruins of much interest and in good preservation.
Tonto	Arizona	Dec. 19, 1907	[1] 640	Do.
Jewel Cave	South Dakota.	Feb. 7, 1908	[1] 1,280	Limestone cavern of much beauty and considerable extent, limits of which are as yet unknown.
Wheeler	Colorado	Dec. 7, 1908	300	Of much interest from geological standpoint as example of eccentric erosion and extinct volcanic action. Of much scenic beauty.
Mount Olympus	Washington...	Mar. 2, 1909 Apr. 17, 1912 May 11, 1915	299,370	Contains many objects of great and unusual scientific interest, including many glaciers. Is summer range and breeding ground of the Olympic elk.
Oregon Caves	Oregon	July 12, 1909	480	Extensive caves in limestone formation of much beauty; magnitude not entirely ascertained.
Devil Postpile	California	July 6, 1911	800	Spectacular mass of hexagonal basaltic columns, like an immense pile of posts. Said to rank with famous Giant's Causeway in Ireland.
Walnut Canyon	Arizona	Nov. 30, 1915	960	Contains cliff dwellings of much scientific and popular interest.
Bandelier	New Mexico...	Feb. 11, 1916	22,075	Vast numbers of cliff-dweller ruins, with artificial caves, stone sculpture, and other relics of prehistoric life.
Old Kasaan	Alaska	Oct. 25, 1916	38.3	Abandoned Indian village in which there are numerous remarkable totem poles and other objects of historical interest.

[1] Estimated.

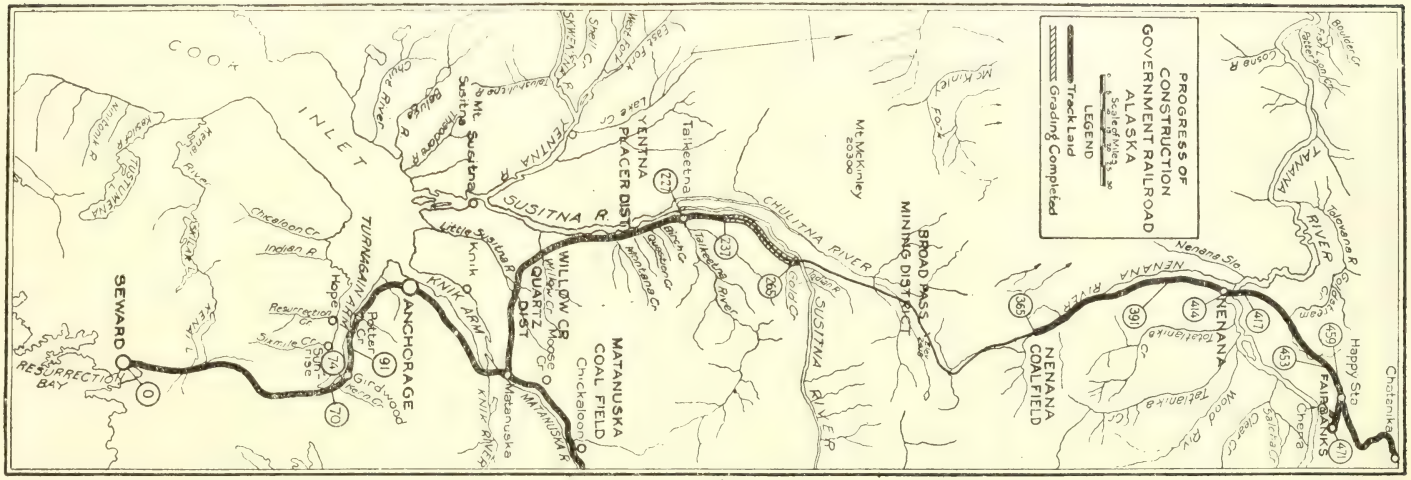
National monuments administered by the War Department.

[Number, 2; total area, 6 acres; chronologically in order of creation.]

Name.	Location.	Date of creation.	Area (acres).	Description.
Big Hole Battle Field.	Montana	June 23, 1910	5	Site of battle field on which battle was fought Aug. 9, 1877, between a small force of United States troops and a much larger force of Nez Perce Indians, resulting in route for the Indians.
Cabrillo	California	Oct. 14, 1913	1	Of historic interest because of discovery of the territory now partly embraced in the State of California by Juan Rodriguez Cabrillo, who at this point first sighted land on Sept. 28, 1542.

APPENDIX C.

Map showing progress of work on Government Railroad in Alaska, 1919.



REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE

REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, September 6, 1919.

SIR: I have the honor to submit a report of the transactions of business in the General Land Office for the fiscal year ended June 30, 1919, together with my suggestions for new legislation.

AREA OF LAND ENTERED AND PATENTED.

The total area of public and Indian lands originally entered and allowed during the fiscal year ended June 30, 1919, is 11,871,181.50 acres, not including 137,403.27 acres embraced in finals not heretofore counted as original dispositions of land. The latter area is constituted as follows: Public auction, 104,721.15 acres; abandoned military reservations, 7,509.29 acres; cash and private sales, individual claimants and small holding claims, 14,090.26 acres; preemption entries, 86.26 acres; and soldiers' additional homesteads, 10,996.31 acres. The area of 11,871,181.50 acres is an increase of 1,896,849.89 acres, as compared with the area originally entered and allowed during the fiscal year 1918. This increase in allowed entries is due to the stock-raising homestead act of December 29, 1916, 5,559,235.11 acres having been allowed under that act.

The area patented during the fiscal year is 10,777,001.349 acres, an increase of 1,224,519.132 acres, as compared with the fiscal year 1918. Of the above area 8,312,318.888 acres were patented under the homestead laws, an increase of 1,819,521.072 acres, not including as homesteads 13,334.12 acres patented as soldiers' additional entries.

CASH RECEIPTS AND EXPENDITURES.

The total cash receipts from the sales of public lands, including fees and commissions ($1,194,472.10), sales of reclamation townsites ($43,863.86), and sales of lands in the Oregon and California railroad grant ($114,008.32), for the fiscal year 1919 were $2,817,063.27. The total receipts from the sales of Indian land were $1,387,781.84. Other receipts aggregated $98,829.19. The total receipts of this bureau during the fiscal year 1919 were $4,303,674.20.

The total expenses of district land offices for salaries and commissions of registers and receivers and incidental expenses during the fiscal year ended June 30, 1919, were $794,984.62. The aggregate expenditures and estimated liabilities of the public land service including expenses of district land offices and surveys made from the appropriations for surveying the public lands outside of railroad land grant limits, were $3,026,554.46, leaving a net surplus of $1,277,119.74 of receipts over expenditures. Disbursements from the following special deposit trust funds and reimbursable appropriations are not included in the above figures as receipts or expenditures: From deposits by individuals for surveying the public lands, $47,020.65; from surveying within land grants (reimbursable), $12,572.36; from opening Indian reservations (reimbursable), $2,672.93; and from surveying and allotting Indian reservations (reimbursable), $54,705.49.

THE FIELD SERVICE.

The sum made available for the Field Service for this year was $500,000. The average number of field employees maintained under this appropriation during the year was 97, and in addition thereto the cost of maintenance of offices of the chiefs of field divisions and the clerical assistance required for them was paid from this appropriation.

The total amount of cash collected and turned into the Treasury as the result of the work of the field force during the fiscal year was $101,298.96; of this amount, $26,754.57 was in settlement of timber trespass cases and $30,648.45 was secured from timber sales; $43,895.94 was recovered through civil and criminal action brought by the Department of Justice in cases of depredations on the public lands and violations of the public land laws. In addition, there has been turned into the Treasury $10,944.41, which represents royalty on coal mined during the past year from a tract in Colorado. This tract has been patented, but title thereto was recovered through suit, and under the decree of court the lessee from those deriving title from the patentee was protected, and the Government therefore now stands, while this lease runs, in the position of lessor.

Under a lease known as the Gebo lease involving certain lands in Wyoming, entered into on August 29, 1912, under and pursuant to private resolution No. 4, approved August 1, 1912, by the department with the Owl Creek Coal Co., by which certain coal lands were leased to said company for a term of 10 years for the purpose of mining and selling coal on a royalty basis, there has been collected during the past year $26,193.35. The mining operations are under the supervision of the Bureau of Mines.

As a result of investigations by the field employees, 164,363.83 acres have been restored during the year to the public domain. Of this amount, 79,040 acres represent fraudulent entries (taking an average of 160 acres to each entry) canceled through proceedings based upon special agents' reports; 85,323.83 acres restored to open range by abatement of unlawful inclosures without suit.

Special agents have investigated and reported on 17,399 cases, 3,447 of which were adversely and 13,952 favorably reported.

Two hundred and fifty-two hearings in Government contest cases have been held.

Civil suits in 65 cases were recommended to the Department of Justice as the result of investigations made during the year. Eighty-six were tried in court, of which 60 were won and 26 lost. As the result of the successful prosecution of these suits, $43,895.94 was recovered and 8,091.26 acres were restored to the public domain, of which 6,180 acres had been unlawfully inclosed.

Of the criminal cases tried during the year, 14 resulted in convictions, under which there were 6 prison sentences imposed and fines amounting to $1,000 paid.

Mention was made in the last annual report of the difficulty in securing competent new men to take the place of those who had left the Field Service. This same difficulty was experienced during the past year, which resulted in maintaining an average force of 97 agents, as against 100 for the preceding year. Owing to the fact, however, that practically all of the field employees who entered the military service have returned, it is hoped that the force will be maintained at its full quota during the coming year.

Satisfactory results have been obtained in the field work, especially in disposing of a great many of the older cases pending for investigation.

The examinations necessary in connection with stock-driveway work, referred to in my last report, have been practically completed in connection with all but very recent applications.

During the past year the field force investigated and reported upon a number of very important cases involving fraudulent entry of public lands and also of trespass upon public lands, with the result that recommendations have been made to the Department of Justice looking to the recovery of a large area of patented land and thousands of dollars as damages for trespass committed.

During the past year the cost of transportation by automobiles amounted to approximately $65,000, an average of 23 cents per mile. Information from other bureaus of this department which used Government-owned machines shows that transportation in the field cost approximately 10 cents per mile. In view of the apparent excessive cost where private machines were used, and, further, owing

to the fact that in many cases reports indicate that it was impossible for our field men to obtain machines where and when needed, Congress was requested to provide for the purchase of motor-propelled passenger-carrying vehicles for the use of the Field Service. The sundry civil bill provides that $15,000 of the appropriation for protecting public lands, timber, etc., may be used in the purchase and maintenance of such vehicles, which will be used at once for that purpose.

During the close of the fiscal year reports of serious forest fires on public lands were received from the field. The fires were especially severe in southern Idaho. The chiefs of field divisions, in whose districts the fires occurred, were directed to assume charge of fire fighting operations and to fully cooperate with local organizations with a view to confining, and, where possible, extinguishing the fires. The only appropriation carrying funds available for the purpose of defraying the expense incurred in this work is the appropriation for protecting public lands, timber, etc., carrying $500,000. This appropriation though not intended by Congress for any such purpose, except perhaps in some very minor amount, has been quite heavily drawn upon. After conference with the General Land Office, identical bills were introduced in Congress, S. 2702 and H. R. 7625, appropriating $500,000, or as much thereof as may be necessary, for the purpose of protecting timber on the public lands from forest fires, to be expended under the supervision of the Secretary of the Interior, either directly or in cooperation with the Department of Agriculture, or the State, or private fire protection associations. Also, for the reimbursement of the appropriation for protecting public lands, timber, etc., in so far as said appropriation has been or shall be drawn upon to meet the expense of fighting fires on the public domain. I think it is entirely safe to assume that practically one-third of the $500,000 appropriated in the above-mentioned appropriation will have been expended in combating these fires. If the Field Service organization, the expenses of which is entirely paid from this appropriation, is to be kept intact and the work carried on, it is absolutely necessary that some provision be made by Congress at an early date to reimburse this appropriation to the full amount expended.

OIL-LAND CLAIMS.

In my report for 1917, a very full statement was submitted as to the situation in the oil fields of California and Wyoming, in the matter of claims pending in the Land Department and before the courts and the main questions involved therein; while in my last report the additional data necessary to bring the oil story up to date was furnished, and the same course will be adopted this year.

CALIFORNIA.

The following tabulation indicates the present situation in respect to mineral applications for withdrawn oil lands in California as well as the unentered lands involved in suits by the Government:

OUTSIDE NAVAL RESERVES.

	Entries.	Acres.
Awaiting field investigation	6	960.00
Awaiting office action on reported investigation	7	1,055.76
Awaiting termination of adverse suits by private parties	4	640.00
Pending before the Register and Receiver on adverse charges by the United States	29	6,010.04
Hearings completed in last fiscal year	24	4,232.76
Awaiting receipt of decision by Register and Receiver	14	2,241.85
Awaiting completion of hearing	15	3,768.19
Pending in General Land Office on hearing record	26	5,862.30
Pending before the Secretary on appeal or motion	3	472.57
Patented in last fiscal year	4	379.85
Canceled in last fiscal year	2	1,579.06
Now pending outside naval reserves	75	15,000.67
Lands in these entries involved in suits by the Government	14	2,162.06
Unentered lands involved in suits by the Government	.....	2,516.79
Lands outside naval reserves involved in suits by the Government attacking patents issued to the Southern Pacific R. R. Co.	.....	133,183.63

IN NAVAL RESERVE NO. 1.

Pending before register and receiver on adverse charges by the United States	10	4,532.95
Awaiting completion of hearing	10	4,532.95
Now pending in naval reserve No. 1	16	4,532.95
Lands in these entries involved in suits by the Government	1	160.00
Unentered lands in naval reserve No. 1 involved in suits by the Government	1	160.00
Lands in naval reserve No. 1, involved in suits by the Government attacking patents issued to the Southern Pacific R. R. Co.	.....	10,754.54

IN NAVAL RESERVE NO. 2.

Pending before the register and receiver on adverse charges by the United States	16	4,485.10
Hearings completed in last fiscal year	1	160.00
Awaiting completion of hearing	16	4,485.10
Pending before the Secretary on appeal or motion	16	2,738.50
Canceled in last fiscal year	1	160.00
Now pending in naval reserve No. 2	32	7,223.60
Lands in these entries involved in suits by the Government	32	7,223.60
Unentered lands in naval reserve No. 2, involved in suits by the Government	.....	800.89
Lands in naval reserve No. 2 involved in suits by the Government attacking patents issued to the Southern Pacific R. R. Co.	.....	15,360.00

SUMMARY.

Awaiting field investigation	6	960.00
Awaiting office action on reported investigation	7	1,055.76
Awaiting termination of adverse suits by private parties	4	640.00
Pending before the register and receiver on adverse charges by the United States	55	15,028.09
Hearings completed in last fiscal year	25	4,232.85
Awaiting receipt of decision by register and receiver	14	2,241.85
Awaiting completion of hearing	41	12,786.24
Pending in General Land Office on hearing record	26	5,862.30
Pending before the Secretary on appeal or motion	19	3,211.07
Patented in last fiscal year	4	379.85
Canceled in last fiscal year	3	1,739.06
Now pending	117	26,757.22
Lands in these entries involved in suits by the Government	47	9,545.66
Unentered lands involved in suits by the Government	.....	3,477.68
Lands involved in suits by the Government attacking patents issued to the Southern Pacific R. R. Co.	.....	159,298.17

Status of proceedings.—In my last report attention was directed to the necessity of having the court suits involving entered lands

made ancillary to the proceedings pending before the Land Department. I understand from information received from the Department of Justice that this has been effected in practically all the cases, either by amendment of the bills or by dismissal of the old suits and the filing of new ones. Special efforts have been and are being made to bring the cases now pending for hearing before the Land Department to early termination, and, as will be seen from the foregoing summary, considerable progress has been made during the past fiscal year.

The protests filed by the Navy Department, referred to in last year's reports as having been substituted in the place of prior proceedings that had been instituted on charges preferred by special agents of this office, have from time to time been extended to include all pending applications for mineral patent for lands within naval reserves Nos. 1 and 2. These include not only the oil and gas claims, but also the fuller's earth claims of naval reserve No. 1 mentioned in last year's report. The local officers have been instructed to issue notices in all these cases, but in none of the cases, excepting those of the Honolulu Consolidated Oil Co., has the testimony been taken. In the Honolulu cases testimony was taken last year, and after a careful consideration of this testimony the Navy Department's protest was dismissed by office decision of February 11, 1919, from which action an appeal was filed and transmitted to the department, where it is now pending.

Although the matter of hearings involving lands within the naval reserves is being conducted by representatives of the Department of Justice for the Secretary of the Navy, every effort is being made to assist these officials in bringing to issue the matters covered by the Navy protests, all other actions on these cases having been suspended to avoid duplication, and to allow concentration of effort by the representatives of this department and the Department of Justice, who are assisting in the prosecution of these cases in the courts and Land Department, as well as to release the defendants from the necessity of defending their claims before two tribunals at the same time on the same issues, and it is understood that these hearings will be prosecuted to finality without unnecessary delay.

Of the 15 cases outside the naval reserves on which the hearings have not been completed, 2 of them involve the validity of the so-called McMurtry locations now being tried out in two Government suits pending in the courts involving unentered lands. The same question is also in issue in a number of the hearings to be held on the protests of the Secretary of the Navy, above alluded to. The suspension of these two cases was authorized on the stipulation that the evidence taken in such cases should be applied to these in so far as

material and applicable. I have recently been informed that in one of the suits referred to a decision has been handed down by the United States district court adverse to the contentions of the Government. It is understood, however, that an appeal from this decision will be prosecuted.

Three of the 15 uncompleted cases belong to the fuller's-earth group, 10 of which are covered by the Navy's protests. For this reason I have authorized the suspension of these three cases awaiting the hearings and decision in the naval reserve cases, which, it is believed, will largely govern in these cases, as the conditions are practically identical.

In a number of the remaining cases a considerable part of the testimony has been taken, and is being taken as rapidly as it is possible to bring them to issue.

It thus appears that the matter of hearings has been reduced to a very close working basis and is well in hand. As new cases arise it is believed they can be investigated and disposed of without serious delay.

WYOMING.

Additional oil withdrawals, aggregating 98,018 acres, were made during the fiscal year in Wyoming and 951 acres were restored as nonoil. On June 30, 1919, 1,180,987 acres were embraced within existing withdrawals. During the fiscal year 19 applications for patent, embracing 3,040 acres of land in the withdrawn area, were rejected and patent was issued on one application, embracing 32.22 acres. Patent also issued on two other applications outside the withdrawn area aggregating 100.16 acres. Ten new applications, embracing 1,440 acres, were filed, and at the end of the fiscal year 58 applications for patent, embracing approximately 8,880 acres, were pending.

OIL CONTRACTS.

At the end of the fiscal year there were 40 contracts under the act of August 25, 1914 (38 Stat., 708), in operation in California, embracing 4,165 acres. Of these, nine are supplemental contracts providing for the disposition of proceeds impounded prior to the entering into of the original agreements. No new agreements were made during the fiscal year, but five were terminated by reason of the issuance of patents for the land covered by such contracts, and one was canceled by the Secretary for failure to comply with the terms thereof, and one other was discontinued at the option of the party on receipt of notice of increase in the required escrow. The production from the tracts covered by these contracts up to June 30, 1919, was 8,270,657.92 barrels of crude oil, 709,725,978 metered

feet of dry gas, and 698,816 gallons of gasoline, and the escrow deposits thereunder amount to $1,152,523.48.

In Wyoming nine contracts covering approximately 800 acres of land in the Salt Creek field are in force. In three of these bonds covering an agreed maximum liability have been filed in lieu of deposits in escrow. Under departmental order of August 8, 1918, effective on and after September 10, 1918, the escrow in this field was increased to an amount equal to the gross proceeds of production, less a fixed sum per barrel allowed as the cost of operation. During the fiscal year operations were discontinued under 27 contracts on receipt of notice of increase in the escrow, through exercise by the contracting parties of the option contained in the contract.

The total production in Wyoming under these various agreements to June 30, 1919, was 9,545,131.20 barrels of crude oil, 286,836,682 metered feet of gas, and the escrow deposits or equivalent (surety bonds) amounted to $3,172,482.36 to the end of the fiscal year.

The total production in both California and Wyoming under these agreements amounts to 17,815,789.12 barrels and $4,325,005.84 escrowed deposits.

Operations are being carried on upon two 40-acre tracts in the Grass Creek field under State leases, which lands are not included in mineral applications or covered by agreements under the act of August 25, 1914. An understanding has been entered into providing for the impounding of the gross proceeds of production, less an allowance for operating expenses. The production from these tracts to the end of the fiscal year was 1,415,555.70 barrels, and the escrow deposits arising from the sale of the oil produced amounts to $2,119,306.58. Operations are conducted on another tract in the Salt Creek field covered by an application for patent against which proceedings were directed and hearing had in the local office; but the case has not yet been finally decided in this department. An arrangement has been effected between the operator and the Department of Justice under which operations are conducted, the arrangement being in the nature of a receivership, an ancillary suit having been instituted in the Federal court which is awaiting determination of the proceedings in this department.

Under arrangements with the operators both in California and Wyoming, including those operating in Grass Creek under lease from the State, $1,192,400 of the escrowed funds were invested in fourth Liberty loan bonds and $1,436,750 in Victory loan notes, which, with the $2,114,850 theretofore invested in Liberty bonds of the first three issues, makes a total of $4,744,000 so invested.

"FERRY" OR "CADDO LAKE" OIL LANDS IN LOUISIANA.

Mention was made in the previous annual report of the institution during July and August, 1917, in the United States District Court, Western District of Louisiana, of 18 suits involving the "Ferry" or "Caddo Lake" oil lands, and a brief résumé of the facts leading up to the litigation was given therein. The suits came up for trial before the district judge during the spring and summer of 1918. The court overruled the motions of the defendants and appointed a special master with power to take testimony and report his findings.

For convenience the above-mentioned suits may be divided into three groups, namely: (1) Where the defendants were claiming under the placer mining laws, (2) claims under the swamp-land grant or claims based upon the doctrine of riparian ownership, (3) claims under the homestead laws. There were 10 suits involving mineral claims and in 9 of those suits the claimants admitted that the legal title to the lands is vested in the United States. In the other suit it was contended that, notwithstanding the fact that the claimant would have acquired a valid mineral claim if the title had been in the Government, yet the United States did not in fact own the land for the reason that it had inured to the claimant or his grantor by virtue of the doctrine of riparian ownership. In seven of the remaining suits the defendants deraigned assertion of ownership either under the provisions of the swamp-land grant or as riparian owners. The eighteenth suit was one in which title was asserted under the homestead laws.

The Government contended in all of the suits that it had never been divested of the legal title to the lands, and that none of the defendants had acquired equities at or prior to the time that the lands were first withdrawn on December 15, 1908, that clothed them with any of the muniments of title.

The total amount which the Government sought to recover in the 18 suits was $644,942.27. Nearly 100 parties, including a number of leading oil companies, were made defendants to the suits.

On January 11, 1919, the master in chancery filed his report in 17 of the suits, recommending decrees in favor of the Government quieting title to the lands and awarding damages aggregating slightly in excess of $400,000. The counter claims of the defendants for the cost of drilling and operating the wells were allowed. On April 7, 1919, the master submitted his report to the court in the remaining suit, United States *v.* Thomas B. Stockley *et al.*, declaring the land to be the property of the United States and awarding damages in the sum of $62,581.85.

On July 15, 1919, the district judge rendered a decision which was entered July 17, 1919, sustaining in every particular the find-

ings of the master. By the terms of the decrees the Government has its title to approximately 617 acres of oil-producing lands quieted and obtains possession of 23 producing oil wells, and is awarded the sum of $462,903.39, together with interest at the rate of 5 per cent from the date of the filing of the master's reports. The court retained jurisdiction in each case for the purpose of adjusting any further equities between the parties. The appointment of a receiver or receivers will doubtless be requested on behalf of the Government in order that the operation of the wells may be continued.

The court found that certain fundamental principles governed all of the cases, with the exception of the Stockley case, namely, (1) that at the time that the original survey was made of the lands abutting on the meanders of Ferry or Caddo Lake, certain portions of the land, inconsiderable as to acreage but now extremely valuable because of the underlying oil deposits, were omitted, which fact was not surprising, considering the unsettled character of the land in 1838 when the original survey was made and the difficulties that must have been encountered; (2) that the contention that there was no ownership of the oil in the Government for the reason that oil is fugitive and different from minerals of a solid character and not, therefore, susceptible of ownership until brought to the surface and separated from the soil must be denied, since the Government is somewhat different from a private proprietor and the integrity of its title in any and all considerations demands that it should have a right of action against anyone profiting by violation of the laws of the United States intended as conservation measures; and (3) that judgment can be sustained against the various pipe-line companies as well as against the parties who drilled and produced the oil.

The case of United States *v.* Stockley et al., involved the question of confirmation of a homestead entry by the proviso to section 7 of the act of March 3, 1891 (26 Stat., 1095). Stockley entered the land before the issuance of the withdrawal order of December 15, 1908. Soon after the withdrawal was made he submitted final proof and paid his fees, which were received by the receiver and noted suspended in unofficial moneys received. More than two years elapsed before adverse action was taken by the Land Department, which subsequently found in a decision rendered by it that the land was mineral in character and known to be such or should have been known to be such by the entryman at the time that he submitted proof. The entry was accordingly canceled, subject, however, to the entryman's right to elect to take a surface patent under the provisions of the act of July 17, 1914 (38 Stat., 509), which he refused to do. A final certificate had never been issued in this case. (See 44 L. D., 178.)

The defendants moved for the dismissal of the suit and set up as a plea in bar the contention that Stockley had become vested with the equitable title and was entitled to a patent under the act of 1891, before the General Land Office directed the hearing as a result of which the entry was canceled. Reliance was placed upon the decision of the United States Supreme Court in the case of Lane *v.* Hoglund (244 U. S., 174).

The Government contended that the act of 1891 did not bar the right to bring the suit and that the Hoglund case was not in point, for the reasons that (1) there never was a final entry, within the meaning of that term as contained in the statute; (2) there was no issuance of receiver's receipt upon final entry; and (3) no equitable right or title accrued, for the reason that the land was prima facie mineral (withdrawn oil) land in character at and prior to date of final proof.

The court held that Stockley did not have a complete equitable title, without which the plea in bar could not be sustained, and that at most he was entitled only to a surface patent, which was tendered to him, but which he declined. The Hoglund case was considered as not being in point.

On July 12, 1919, another suit was instituted upon recommendation of the Land Department in the United States District Court, Western District of Louisiana, against certain oil companies to quiet title to alleged unappropriated reserved surveyed public lands in the SE. ¼ sec. 9, T. 21 N., R. 16 W., Louisiana, and to recover the sum of $317,919.38, the value of oil extracted therefrom.

ARKANSAS "SUNK LANDS" AND "LAKE LANDS."

The work relating to the Arkansas "sunk lands" and "lake lands" since the issuance of the previous annual report has been in the nature of a cleaning-up process. When the United States Supreme Court rendered its decision November 5, 1917, in the suit of Lee Wilson & Co. *v.* United States, it placed the Government in a position where it could go forward by rapid strides, and the past year has witnessed the accomplishment of a large amount of work that has shown actual results. During that time a number of court decrees, involving large areas, have been entered and become final; the suspension against the issuance of final certificates and patents of homestead entries has been vacated as to a number of so-called lake areas, and numerous entries have been patented; most of the timber-trespass cases have been disposed of; the suits now pending on the court docket have been advanced to such a stage that decrees will be obtained within a short time; and practically all of the lands involved in cases recently decided by the Land Department have been surveyed in the field.

A favorable decree was obtained by the Government on June 25, 1919, in the most important, in so far as the value and quantity of the lands involved is concerned, of all of the sunk-land suits. The suit was styled United States *v.* Chapman & Dewey Land Co. et al., equity No. 49. The decree which was rendered by the United States District Court, Eastern District of Arkansas, quiets title in the United States to an area of approximately 54,000 acres of land situated in Greene, Craighead, and Poinsett Counties, Ark., extending along the St. Francis River for a distance of 40 miles. They are, for the most part, river-bottom agricultural and timbered lands said to be worth on a conservative estimate about $50 per acre, or $2,700,000. The Land Department decisions upon which court action was predicated were rendered December 8, 1908, and February 27, 1909 (37 L. D., 345 and 462). There were 184 defendants. The suit had been pending since October 1, 1917.

On June 21, 1919, the Government obtained a decree in the United States District Court, Eastern District of Arkansas, in the suit of United States *v.* John W. Walker et al., equity No. 51, involving approximately 700 acres of land in an area locally known as "Tyronza Cut-off," situated in T. 12 N., R. 8 E., Arkansas. The cut-off area is traversed by the Tyronza River, a narrow, permanently flowing stream, less than 3 chains in width. When the township was originally surveyed the width of the river, as meandered by the surveyors, was shown as greatly exaggerated. The Government successfully contended that the stream never was a meanderable stream and should not, therefore, have been meandered. The case is important in that it may have considerable weight in the determination of a large number of cases involving other areas similarly circumstanced.

Since the institution of the "sunk lands" and "lake lands" suits, the Government has obtained decrees quieting title to Moon Lake, about 850 acres; Buford, Carsons, Clear, Flat, Grassy, Hickory, Tyronza, and Walker Lakes, aggregating approximately 20,000 acres; Round Lake (No. 2), 200 acres; Right Hand Chute of Little River, about 5,700 acres; the sunk lands proper, about 54,000 acres; and Tyronza Cut-off, about 700 acres; total, 81,450 acres, approximately. Suits are still pending involving the question of title to Big Lake, about 22,500 acres; Bagwells Lake, about 700 acres; and Browns Lake, about 830 acres. The riparian claimants have been successful in acquiring title under the decrees to only a few small scattered areas aggregating less than 1,000 acres. Besides recovering the above-mentioned lands, the Government has also collected and covered into the United States Treasury $48,719.97 for timber cut in trespass and removed from the lands.

In many instances persons had settled upon the so-called lake and sunk lands prior to the time that the Government took steps to assert title to the lands, and in a number of cases the action taken by the Land Department was predicated upon applications for survey filed with it by such settlers. In view of that fact the General Land Office at the outset decided to permit the lands to be entered as soon as they should be surveyed, with the understanding, however, that all entrymen were to assume the risk of being ousted should the courts finally determine that the title to the lands was not vested in the Government. Consequently, nearly all of the lands have been settled upon or entered pursuant to the homestead laws. The issuance of final certificates and patents has been withheld until final decrees shall have been obtained. During the present year the restrictions with reference to the Moon, Buford, Carsons, Clear, Flat, Grassy, Hickory, Round (No. 2), Tyronza, and Walker Lake areas, and the "Right Hand Chute of Little River" area in T. 12 N., R. 7 E., final decrees having been entered in the suits involving these lands, were removed, and patents have been issued to all of those entrymen who appeared to be entitled to receive them. To date, 165 patents have been issued placing the title to approximately 19,000 acres in the above-mentioned areas in private ownership. The restrictions will be removed as to the remaining areas which the courts have decided belong to the Government as soon as the decrees become final.

On April 7, 1919, a decision was rendered by the Land Department asserting title to an area locally known as Round Lake, comprising about 600 acres in T. 11 N., R. 10 E., Arkansas. An act had previously been enacted (Private No. 48, 65th Cong., 3d sess.) authorizing the Government to sell that area to the riparian claimants at $12.35 per acre. The lands are being surveyed to the end that they may be disposed of pursuant to the terms of the aforesaid act.

On April 23, 1919, the General Land Office rendered a decision denying an application for the survey of lands within areas locally known as Hudgens and Mill Lakes, situated in T. 14 N., R. 12 E., Arkansas, on the ground that the evidence did not conclusively show that material error or fraud had been made by the Government surveyors at the time that the adjoining lands were surveyed. An appeal has been entered and the case is now pending before the Secretary of the Interior.

On July 31, 1919, a bill, H. R. 8084, was introduced proposing to authorize the Secretary of the Interior to sell to certain riparian claimants the lands within that part of an area locally known as Golden Lake, which is situated in T. 11 N., R. 10 E., Arkansas.

On June 23 (calendar day, June 24), 1919, a bill, S. 2231, was introduced, which if enacted will permit the Secretary of the Interior to sell any unsurveyed land in Arkansas that was erroneously omitted from survey at the time that the original surveys were made, provided that said land is not embraced within any valid homestead entry or settlement claim, and provided further that it had previously been claimed in good faith by a riparian claimant who, under the belief that he owned it, had reduced it to cultivation or had placed valuable improvements upon it.

The bills, S. 4746 and H. R. 11715, which were introduced during the Sixty-fifth Congress, proposing to authorize the local drainage districts to include within their projects the unreserved public lands within the areas of so-called Big Lake and of the so-called St. Francis River sunk lands and to subject said lands to local taxation in like manner as privately owned lands, have been reintroduced during the present session of the Sixty-sixth Congress as S. 237 and H. R. 3175.

The attention of the General Land Office has been recently directed to the fact that there is more or less uncertainty among the landowners in T. 10 N., Rs. 7 and 8 E., Arkansas, with reference to the question of their titles owing to alleged erroneous or incomplete surveys in the meandering of small lakes or narrow river areas. On July 19, 1919, an Executive order was issued temporarily withdrawing all surveyed and unsurveyed lands within those townships, pursuant to the provisions of the act of June 25, 1910 (36 Stat., 847), as amended by the act of August 24, 1912 (37 Stat., 497). The withdrawal is designed to prevent persons who have no present established rights from initiating claims that might obstruct the effectiveness of any adjustment that is to be made after the incomplete or erroneous surveys have been completed or corrected.

The Executive order issued April 13, 1917, withdrawing public lands within the so-called St. Francis River sunk-land area in Arkansas, as an aid to the investigations to be made by the United States Army Engineers under appropriation acts of July 27, 1916 (39 Stat., 409), and of August 8, 1917 (40 Stat., 250), is still in effect.

The work of the forthcoming year with reference to the Arkansas "sunk lands" and "lake lands," will be principally that of a finishing process.

SURVEYS.

The year just closed has been an active one in the official disposition of returns of surveys and resurveys. By the aid of surveyors, detailed to this office to assist in their final examination, a large amount of work was accomplished which does not show in the aggregate acreage of accepted work.

The recorded total is 7,668,514 acres, but at the close of the year there were 240 plats of townships favorably reported upon and accepted but not recorded, because not yet reproduced by the Geological Survey for filing. This was owing to a failure of the appropriation for copying plats. Had these plats been counted there would be a record, it is estimated, of two and a half millions of acres more, thus reaching beyond the 10,000,000 mark.

RESURVEYS.

Within the past fiscal year the possible scope of resurvey procedure has been greatly enlarged by the enactment of legislation whereby the Government is authorized to resurvey townships heretofore held to be ineligible for resurvey under existing departmental regulations by reason of disposals in excess of 50 per cent of the total area thereof.

This legislation, approved September 21, 1918 (40 Stat., 965), provides for an equitable division of the cost of the resurvey between the applicants and the Government in proportion to the extent of their respective holdings, and under the terms thereof it is now possible to care for those applications which, although of evident merit, have heretofore been rejected for the reason that the extent of the public land remaining in the township was insufficient to justify the considerable expenditure of public funds which would be required if the entire expense of the resurvey were borne by the Government.

Suitable regulations for procedure under the terms of the act have been promulgated and the inquiries already received indicate that when the possibilities thereof are more fully recognized by the public, a greatly increased demand for resurveys may be expected, particularly in the older public-land States where title to the greater portion of the lands has long since passed from the United States, and where hitherto no relief from the unsatisfactory conditions due to excessive obliteration or to defective original surveys has been possible.

FRAGMENTARY SURVEYS.

The work of the Eastern Surveying District includes the miscellaneous fragmentary public-land surveys and examinations, and Indian surveys, in those States where the former United States surveyor general offices have been discontinued. The active work of the past year extended into nine States, as follows: Alabama, Arkansas, Florida, Kansas, Louisiana, Michigan, Minnesota, Oklahoma, and Wisconsin. The Commissioner, as ex-officio United States surveyor general, performs all of the duties incident to authorizing and approving the surveys, ordinarily required of the surveyors general

(sec. 88, R. S. 2219). The field work in this surveying district is placed under the immediate charge of the associate supervisor of surveys, who reports both to the Commissioner and to the supervisor of surveys. Surveyors are detailed to this district as needed, the number averaging from five to eight. One technical examiner and computer, and one draftsman, both in the office of the supervisor of surveys at Denver, Colo., now prepare most of the plats of the surveys. Heretofore it has been necessary to secure a draftsman in the Washington office, but this has now been largely obviated by the permanent transfer of a draftsman to the Denver office.

The surveys approved during the past fiscal year extended into 28 townships, with an aggregate area of 27,603.29 acres. This includes the Fort Sabine abandoned military reservation in Louisiana; the so-called "Golden Lake" survey in northeastern Arkansas; similar areas between the record meander lines and actual shore lines of several lakes in Florida, Minnesota, and Wisconsin; and 48 islands in Arkansas, Florida, Michigan, Minnesota, and Wisconsin (one of which contained 893.28 acres). The other special work included miscellaneous Indian allotment surveys, mission tracts on Indian reservations, special townsite surveys, and the Bayside abandoned military reservation, Point Comfort, N. J.

At the close of the fiscal year there was pending before the Commissioner for approval the returns of the limited surveys in Tps. 36, 37, and 38 S., R. 30 E., Tall. meridian, Florida, and an extension survey to include 926.64 acres of land and accretions thereto fronting on the Missouri River in Nebraska. The latter has involved much litigation in the local courts. The former involves gross discrepancies in the original surveys, which would ultimately lead to serious litigation if relief were not afforded by resurvey. In the townships in Florida extensive areas formerly shown as land in place are found to be occupied by numerous large lakes, and conversely, resulting in the erroneous entry of lake area on the one hand, and erroneous location on unsurveyed public land on the other hand. Special legislation for the relief of settlers has been proposed in pending bills S. 55 and H. R. 1709.

The extensive erosion surveys along the Red River in the former Kiowa and Comanche Indian Reservations in Oklahoma have been completed and the field notes and plats prepared for approval. The allotment surveys within the Grand Portage Indian Reservation in Minnesota have also been completed and the field notes and plats prepared for approval.

The new surveys during the past fiscal year embraced 1,231 miles of field work at an average cost of $20.44 per mile. The important surveys completed include the Camp McClellan Military Reservation in Alabama; one resurvey in Florida by special deposit under

the act of September 21, 1918; the so-called Swan Lake, Carters Lake, Youngs Lake, and similar areas on Pemisco Bayou and Little River in northeastern Arkansas; similar areas in Minnesota and Wisconsin; and numerous island surveys. The field notes and plats of these complete surveys are in course of preparation. The most important field work in progress at the close of the fiscal year is the resurvey of the section lines and re-marking of the allotment corners in 47 townships on the Leech Lake Indian Reservation in Minnesota, begun in 1917. Six parties are engaged in this work, operating from two camps. A limited amount of new miscellaneous fragmentary work is awaiting survey when the same can be reached in regular order, consistent with minimizing the travel expense and utilizing the most favorable season in each of the various localities.

SURVEYS IN ALASKA.

The progress made in the execution of surveys of the public lands in Alaska during the fiscal year was satisfactory, notwithstanding the great handicap under which all field services have labored during the past two years. Of the 10 cadastral engineers, surveyors, and transitmen comprising the Alaska organization in the year 1917, 4 were voluntarily in the Army in the season of 1918, 1 of whom, Lieut. A. J. Bradford, the aviator, made the supreme sacrifice at Chateau-Thierry. Among the field assistants the percentage in the Army and Navy was much greater, as the class of men from which our field assistants are drawn is the same as that from which the military forces are selected. The surveying crews of the Alaska parties, therefore, were made up almost exclusively, as in the States, of older men and of boys below military age. This handicap, however, was partly overcome by the extra efforts put forth by all.

In accordance with the General Land Office policy of spreading the rectangular survey over agricultural areas along and tributary to the Government railroad, the rectangular net was further extended in the Tanana Valley under group No. 8 on the north side of the river for about 12 miles northerly from the town of Nenana. In this work and, in fact, all along the line of the Government railroad great economy of field operation has been effected through the practical cooperation of the Alaskan Engineering Commission with this service. This cooperation has led to an economic concentration of effort for the general welfare and in many instances has precluded the possibility of wasteful duplication of work, especially in trail building and in the transportation of supplies.

Surveys in the Tanana Valley are abreast of construction work on the railroad and somewhat ahead of the actual requirements of settlement and were therefore not resumed this summer in that particular locality. In this connection it may be of general interest to

engineers and surveyors, and is especially gratifying to this office, to note the closure in T. 2 S., R. 3 W. (of the Fairbanks base and meridian), between the Fairbanks group of surveys completed in 1912 and the Nenana coal field group of surveys initiated therefrom by geodetic triangulation in 1915. These latter surveys have been expanding northerly and easterly each succeeding year through the slow and tedious process of sectionizing first the coal-bearing hills of the upland country, then the swamps and lowlands of the Nenana Valley, thence the timber and brush-covered lands of the Tanana Basin until the coal field group of surveys finally reached and closed upon with flattering results the older system of surveys from which they were originally initiated.

In the Susitna Valley the surveying operations, commenced in the spring of 1918 under group No. 10, were resumed and continued throughout that surveying season by a single party. The area covered by the survey is situated between the river and the foothills to the east, through which the railroad passes, and extends to the head of the valley, about 4 miles north of Talkeetna. As the river narrows at this point to almost the proportions of a canon in places it is not thought that further surveys northerly will be necessary for some time; however, after the completion of the railroad it may be deemed advisable to extend a narrow strip of surveys northerly along the railroad for information purposes and to serve as a base for possible future surveys in the Broad Pass country.

In the Kachemak Bay region rectangular surveys begun in the spring of 1918 under group No. 9 were continued during that surveying season along the east shore of Cook Inlet as far north as Point Starichkof. These surveys include T. 5 S., R. 13 W., T. 5 S., R. 14 W., fractional Ts. 4, 5, and 6 S., R. 15 W., and T. 6 S., R. 14 W., of the Seward base and meridian. In the spring of 1919 surveys were begun under group No. 11 in the region adjacent to and north of group No. 9. This work is being extended northerly with a view to embracing the scattering settlement along the shores of Cook Inlet including the village of Ninilchik, one of the oldest Russian settlements in Alaska. The surveys in this region, as in fact in all other parts of the Territory, are primarily for the purpose of meeting the requirements first of existing and then of prospective settlement. The settlement at present along the east shore of Cook Inlet extends inland for a distance of from about 2 to 6 miles. This area will soon be included within the limits of the Land Office survey. The lands between the eastern limits of the survey in this locality and the foothills, in fact the whole vast stretch of country from Kachemak Bay to Turnagain Arm between Cook Inlet and the foothills to the east, while well adapted to agriculture and stock raising, has as yet by reason of its comparative inaccessibility failed to attract to any

great extent the American homesteader and stock grower. There are no good harbors along its shore line even for small craft nearer than Homer on Kachemak Bay. However, the Government railroad now passes through the northern extremity of this great undeveloped region and will no doubt stimulate exploration and settlement and encourage the building of roads. It will soon need attention in the matter of survey. In addition to the agricultural possibilities it is said that a large portion of this country is underlaid with a fair grade of lignite coal which can be economically worked. This fact again recalls the desirability of the enactment of legislation which will permit of the homesteading of surface rights of lands underlaid with coal and oil. This also applies to the lower Matanuska and to parts of the Susitna Valley where the same physical and geological conditions obtain.

During the latter part of the fiscal year the rectangular system of surveys was inaugurated in the Chilkat Valley near Haines, under group No. 12. In this valley there are some 40 or 50 homesteaders, a small number of whom have had their claims surveyed by deputy surveyors at their own expense. There are also other isolated surveys scattered throughout the valley, which are quite independent of one another, and subject to no one system of control. The desirability of spreading the rectangular net over this locality is apparent, and the plan of relating it to the Copper River system of surveys is both practical and economical. In accordance with this plan, the geodetic position of one of the triangulation stations of the United States Coast and Geodetic Survey, in the vicinity of Haines, was ascertained, and its position computed in the rectangular net, and referred to the Copper River base and meridian. The Land Office surveys are being extended therefrom to and over the valley. The progress made on this group up to the end of the fiscal year was quite satisfactory. The complications resulting from the contact of the subdivisional surveys with the existing isolated surveys and the problems arising therefrom, while tending to retard progress on the line, are not serious but, nevertheless, emphasize most emphatically the great desirability from every viewpoint, especially that of the settler, of extending the rectangular system of surveys in advance of settlement whenever practicable.

TOWN SITES.

The survey of the Petersburg subdivision, begun in the latter part of the last fiscal year, was completed and the plats delivered to the town-site trustee. The cost of this survey is reimbursable to the appropriation, and is charged to the lot owners. This cost, as in the surveys of the town sites of Haines and Douglas, was quite small to the individual lot owner, and represents a consider-

able saving over the old system where the trustee employed an independent surveyor or contracted the work. In this case the chief of field division of the General Land Office was trustee for the town site and the survey was made in cooperation with him as such.

The town site of Talkeetna on the Government railroad was surveyed in September, 1918, by the surveyor already on the ground in connection with his work of surveying group No. 10. This arrangement eliminated all transportation cost of travel to and from the town-site work. The survey was made in cooperation with the Alaskan Engineering Commission and in accordance with its requirements.

The addition to the town site of Nenana, which was surveyed last season, was revised this fiscal year, in accordance with the desires of the Alaskan Engineering Commission, and the survey monumented. This work was delayed considerably on account of floods.

The survey of the boundary lines of an addition to the town site of Juneau was completed in the field before the end of the year. The final field notes and plats of survey are now being prepared in the Juneau office.

EXAMINATION AND SPECIAL SURVEYS.

Examinations of a number of isolated surveys were made during the fiscal year near Haines, Kake, Ketchekan, and Hot Springs and along the north shore of Icy Straits. Cemetery sites were surveyed at Valdez, Skagway, Haines, and Anchorage. Two homestead surveys were made under the act of June 28, 1918 (40 Stat., 632), and one special survey of the Tanana mill site near Fairbanks was executed during the season.

RECOMMENDATIONS.

The surveys partly completed under group No. 11 in the Kachemak Bay region should be extended next season, northerly from Point Starichkof by a double party over the area along the east shore of Cook Inlet. The surveys initiated during the latter part of this fiscal year under group No. 12, in the Chilkat Valley, should be extended by a double party up the Chilkat River, over the Haines Peninsula and up the Chilkoot as far as settlement requirements dictate.

There is also an increasing demand for rectangular surveys on the north shore of Icy Straits, east of Glacier Bay. Three homestead surveys in this area, on Salmon River, were made by deputy surveyors some time ago, and rejected on examination. Under the act of June 28, 1918 (40 Stat., 632) these homesteaders are now entitled to a survey at Government expense. There are also three or four other

homesteaders in the same locality, and a fair prospect of the coming of others in the near future. Furthermore, the unoccupied areas in this vicinity are of such character as might alone warrant the extension of the rectangular system thereover. This work should be initiated early next season.

It is also probable that a further extension of surveys in the Tanana Valley will be necessary next fiscal year. Additional townsite surveys along the line of the Government railroad will also probably be required. Other parts of the territory should receive attention in the matter of survey from time to time as settlement and the prospects of settlement might indicate, such as the valleys tributary to the Susitna, the Eagle River Valley, portions of Kodiak Island, fertile spots in southeastern and southwestern Alaska, and favored areas in the valley of the Kuskokwim. Whenever practical and the extent of the area under consideration warrants, these surveys should be referred to the existing survey systems of Alaska.

It is believed that the normal allotment to Alaska from the appropriation for surveying the public lands will be sufficient to meet the demands for survey, as they now present themselves, during the next fiscal year.

HIGH COST OF SURVEYS.

The cost of field work anywhere is regulated largely, and often entirely, by physical characteristics of the country under survey (topography and vegetation), weather conditions, and location with respect to supply stations. This is particularly true of surveys in Washington, where we are surveying the State exchange lands. These lands lie along the watersheds of the Cascades and Olympic Mountains in some of the roughest and brushiest and wettest country in the United States or Alaska, and are so remotely situated with respect to the beaten paths of travel and the bases of supplies that it often becomes necessary for the entire surveying crew to cut and build trails before they can man-pack their outfits to the field of operation. The almost daily rains and fogs, the trail cutting, and the natural difficulties of progress on the line on account of the roughness of the surface and the density of the vegetation, when it is possible to work on the line, bring up the cost of the work to a high figure if we measure it on a mileage basis. And yet even the cost of $70.57 per mile in this, the most difficult country, perhaps, we have ever surveyed, and at a time when wages, food, and material are far higher than ever before, is less than the direct cost of some surveys in Washington and Oregon 11 years ago under the contract system. I refer to the direct cost per mile. If we figure in the cost of the field examination under the contract system, perhaps several examinations of the same work, at Government expense, the

cost would be still greater. This high rate under the contract system was paid under the so-called per-diem plan; that is, when it was impossible for the Government to secure bidders on a contract for surveying under the double maximum statutory rate, proposals were invited on a per-diem basis, the bidder naming a rate by the day for so many days, of sufficient size to cover the expense of outfitting, traveling to and from the field, the line work, and all probable delays. Reduced to a mileage basis, the direct rate paid by the Government in some of these cases exceeded $75 a mile. With the cost of a field examination or more added to this, the actual rate per mile paid out by the Government sometimes exceeded $100 a mile. This, too, was during the period of low operating cost, when competent men were clamoring for places on the parties and the survey was over country not as difficult to survey as some of that in which we are now operating. Furthermore, we have been executing surveys during the past six or eight years (in many States) that could not have been executed at all under the old system, even under the per-diem plan of payment under that system. No experienced surveyor of reputation would have risked his fame and fortune on contracts to survey the rougher country and some of the fragmentary work in many of the States, which we have since surveyed under the direct system. The uncertainty alone as to the extent of retracement of old surveys he would have to make, before finding a proper starting and closing line, and the possibility of not being able to find these lines at all, was a sufficient reason to discourage even the most venturesome bidders. The cost of field work per mile in Washington State is high, but I believe it is commensurate with the work in hand. It could not have been done at all under the old system.

MANUAL REVISION.

Since the last annual report, in which it was announced that five chapters of the new manual of surveying instructions had been prepared, the sixth chapter, which is devoted to procedure in the case of resurveys, has been completed, and the entire six chapters are in process of printing and binding for distribution.

The demand for the revised manual has been so great as to warrant the issue of the six chapters at once without waiting for the remaining four chapters to be prepared.

The sixth chapter, which has already been mimeographed and placed in the hands of those of the surveying force engaged upon resurveys, treats of the following subjects:

Jurisdiction.
Limit of authority of surveyor.
Bona fide rights of claimants.
General field methods.

The dependent resurvey.
- (*a*) General control.
- (*b*) Reestablishment of true lines.
- (*c*) Additional methods for the protection of bona fide rights.
- (*d*) Example.

The independent resurvey.
- (*a*) Reestablishment of outboundaries.
- (*b*) Metes-and-bounds survey of private claims.
- (*c*) The projection of new lines.

WORK IN OFFICES OF SURVEYOR GENERAL.

(The consolidated yearly report for the fiscal year is shown in the appendix.)

This report shows that there were approved 39,592 miles of subdivisional surveys and resurveys, which is 2,266 miles more than approved last year. The total average cost has increased from $19.87 last year to $20.53 this year, but the office cost shows a decrease from $2.10 per mile last year to $1.91 per mile this year. The average field cost increased from $17.77 last year to $18.62 this year. Of course, the execution of the field work is becoming more expensive on account of increased living expenses, higher wages, and the more complicated surveys. The surveys approved covered 11,077,359.61 acres, at an average cost of $0.073 per acre, which is 1,472,877.61 acres more than were approved last year, at approximately the same total cost per acre.

The total number of townships pending in the offices has been reduced from 747 last year to 374 this year, which is a reduction of just one-half. The work in all of the offices is practically current. The two offices showing the greatest number of surveys pending are Arizona and California. Of the 102 townships pending in Arizona, 52 are completed and ready for approval, and the 50 townships pending will just about last, with the present force, until next season's field work begins to come in. Of the 69 townships pending in California, 45 are completed, which leaves but 24 townships pending in that office, and these can be easily handled with the force now employed. A like percentage of the work pending in the other offices is also completed and will be approved and forwarded for acceptance as soon as other townships in the groups are completed.

MINERAL SURVEYS.

The work in the mineral divisions of the various offices is steadily decreasing from year to year. Last year 1,931 locations were approved, at an average cost of $14.75. This year only 1,488 locations

were approved, at an average cost of $16.22, showing a decrease of 443 locations and an increase in the cost of $1.47 per location. This increased cost can be accounted for by the fact that the mineral clerks this year were allowed the increased compensation, which has not previously been allowed them, and also because in many of the offices there was no regular mineral draftsman employed and the work was done by agricultural draftsmen who were not familiar with the details of the work, and consequently took more time.

There are 395 locations pending office examination this year as against 552 last year. This work is well in hand.

FOREST HOMESTEADS.

The forest homestead work is also decreasing rapidly. Special instructions for but 237 surveys were approved this year, whereas last year 437 were approved. This year 215 surveys were approved, as against 553 last year. This work will gradually grow less and less as the lands subject to such appropriation in the National Forests are entered.

INDIAN RESERVATIONS.

This year there were approved about three times as many miles of surveys in Indian reservations as were approved last year, and the cost increased from $20.53 to $35.16. These are special surveys and the cost naturally fluctuates according to the nature of the work. There are this year 2,022.56 miles pending in the offices as against 971.50 last year, or a little over twice as many miles.

MISCELLANEOUS SURVEYS.

Miscellaneous surveys include town sites, small holding claims, examinations, and all other special surveys, and but very little idea can be gained of the character and cost of the work by a comparison with the figures of last year. Surveys under this head this year ran from $3.33 per mile to $114 per mile, and last year they ran from $9.38 to $648.98 per mile, depending upon the class of survey being executed. Last year the average cost per mile was $29.61 and this year it was $53.52. The amount of work pending last year was 14 townships and 412.4 miles, and this year there are pending 2 town sites, 14 townships, and 487.2 miles.

SUPPLEMENTAL PLATS AND RECORDS.

There were 493 supplemental plats made this year as against 557 last year, and the various offices earned $6,065.78 for copies of records as against $5,617.50 last year.

IN GENERAL.

The work done in the offices of surveyors general this year is very creditable, and, taking into consideration the advanced cost of every line of work, I think these offices have made an excellent showing. We have eliminated the big arrearages in several of the States, and the work is now as nearly current as it can be.

COMMENTS FROM THE ANNUAL REPORTS OF SURVEYORS GENERAL.

ARIZONA.

The surveyor general, in his annual report for the last fiscal year, states that his office approved plats of 191 townships, which is nearly 40 per cent increase over the preceding year.

CALIFORNIA.

The surveyor general recommends that a special appropriation of $65,000 be made for resurveying and retracing the oblique boundary line between California and Nevada and making proper closings of the present public-land surveys thereon. He also recommends the resurvey of the international boundary line between California and Mexico, and estimates that to do this and include the segregation of the 60-foot strip would cost about $50,000.

He estimates the cost of completing the field and office work of surveying lands within railroad land grants to be $75,000—$17,000 for surveys within primary grant and $58,000 for those within overlapping grants.

NEVADA.

The surveyor general in his annual report, in asking for an increase in the apportionment to his State for surveys, says that the present allotment is not adequate to meet the demand for surveying the public lands under the first preference alone. He believes there is much land suitable for agriculture, irrigation, or dry farming—all coming under the second preference—and the survey of the same would materially aid in the development of the State. A large number of applications for the extension of the public-land surveys have been filed during the past year, and he anticipates a larger number will be filed the coming year than heretofore, owing to the fact that many of our returned soldiers are desirous of obtaining homesteads.

UTAH.

In his annual report of operations in his district, the surveyor general states that although the 20,000,000 acres of unsurveyed land in this State have been considered in the past unfit for agricultural pur-

poses, much of it is now conceded to be adapted for dry farming and grazing purposes, and the present estimate is that more than one-half of the above amount can thus be used, and it is now being sought for by returned soldiers and sailors and other young men brought up on Utah farms. He is of the opinion that no work of more importance could be performed by the Government than having these lands surveyed as early as possible so that this land would be brought under cultivation and made productive, and these citizens be thus engaged in useful pursuits and making permanent homes. As no entry can now be made prior to survey, the citizen hesitates to go upon and improve the public lands before making entry.

WYOMING.

The surveyor general offers the following observations touching upon his apportionment:

There was allotted this office for the fiscal year 1919 the sum of $50,000, of which less than $40,000 was expended, notwithstanding the purchase of a motor truck for use of the surveying service. The saving of $10,000 is accounted for solely by the fact that on account of war conditions only a very small number of surveyors was available for use in this State. In view of the fact that more men are now available and that a high level of costs is being maintained for labor and supplies, I would recommend that we be allotted the sum of $50,000 for surveys and resurveys in this State during the fiscal year 1920.

In resurvey work we have many townships to be undertaken under the provisions of the act of Congress approved May 29, 1908, and must provide for the cost of some difficult and expensive investigations and resurveys authorized under the act of March 3, 1909. It is estimated that $45,000 would be sufficient for the amount of field work required on township resurveys, which would leave the sum of $5,000 for the cost of original surveys and fragmentary surveys of various kinds, the need of which is constantly arising in this State. From inquiries we have been receiving, it is apparent that there will be a demand for the survey of several fractional and full townships of unsurveyed lands in this State within the next year or two.

COLORADO.

The following extract is from the annual report of the surveyor general:

For the past few years I have urged the apportionment to this district of larger amounts from the appropriation for the survey and resurvey of public lands, in order that back work might be brought up to date and at the same time the present demand taken care of. The allotment for both 1920 and 1921 should at least equal that for 1919—$50,000.

Applicants are required to deposit actual cost of office work for mining claim surveys (see 35 Stat., 645). Actual cost keeping has demonstrated that this system puts the applicant for a single mining claim survey at a disadvantage as against the applicant for group surveys, the burden of expense being carried by the former. Such practice, in my opinion, is not conducive to the best interests of the public and meets with considerable objec-

tion. I, therefore, urgently recommend legislation authorizing flat fees to be deemed fully earned upon completion of the work, and all deposits by individuals to be covered into the general fund.

ALASKA.

The surveyor general, in his annual report for the past fiscal year, states that—

The approximate area of the unappropriated public lands in Alaska is 354,281,760 acres, and from authentic sources it is estimated that fully one-fifth of the area is tillable and pasture lands, capable of supporting a large agricultural population.

These areas are diversified over the entire Territory south of the Yukon River. Even in the Alexander Archipelago and adjacent mainland, which appear so forbidding for agricultural purposes to those viewing Alaska from steamboats, while sailing through the inland passages, it is estimated that fully 5 per cent of the land is subject to agriculture.

The extent of the public surveys thus far made in Alaska is essentially a negligible quantity in comparison with what remains to be surveyed. In further extending the surveys in the Susitna, Tanana, and other large valleys it is respectfully suggested that care be taken in selecting the lands to be surveyed; that only the best and most adaptable land for cultivation be selected, and that large tracts of swamp land be omitted. This should be done even if it results in the survey of noncontiguous townships.

There are many small agricultural settlements in close proximity to the larger town and mining centers, where a ready market for the products is found, that should be surveyed even if it is necessary to establish an independent base and meridian to do so.

The act of Congress approved June 28, 1918 (40 Stat., 632), provides for the survey of homesteads without expense to the claimant. When this becomes generally known there will be many applications for surveys.

The policy of surveying Indian allotments should be renewed to avoid complications with Indian claims and to adjust conflicts.

In view of the conditions herein stated, it is considered that the estimate of $50,000 for the surveying service in Alaska is conservative.

OKLAHOMA-TEXAS BOUNDARY LINE.

Oil discoveries along Red River adjacent to the former Kiowa, Comanche, and Apache Indian Reservations has given rise to questions before the department which are affected by the location of the boundary between Oklahoma and Texas along Red River.

In the "Greer County case" (U. S. *v.* Texas, 162 U. S., 1), it was held that the northern boundary line of Texas was along the south bank of Red River. Decisions by the Texas courts before and after the above decision have held that the boundary line of Texas was in the middle of Red River. In defining the boundary between Kentucky and the territory northwest of the Ohio River, the Supreme Court has held that the boundary extends to low-water mark on the northern side of the Ohio River. (Ind. *v.* Ky., 136 U. S., 479.) The boundary between Maryland and Virginia is "the south bank

of the Potomac River at low-water mark." (Md. *v.* W. Va., 217 U. S., 1.) The boundary between Alabama and Georgia has been defined as along the west bank of the Chattahoochee River at the lowest edge of the permanent fast land bank, being the same natural line which divides the bank from the bed of the river. (Howard *v.* Ingersoll, 13 Howard, 381.) These decisions are controlled by the terms of the conventions and by physical features of the respective rivers.

Red River was established as the north boundary of Texas in a treaty between United States and Spain in 1819, which was ratified and confirmed in a treaty with the Republic of Texas in 1838. The location of the boundary with reference to the stream is on the south bank according to principles of international law then recognized rather than the aquae filum rule of the common law.

Owing to the variation in the water level of Red River between periods of extreme drought and of floods and freshets, the exact location of the boundary line along the bank of the river has become a matter of importance in determining controversies between those claiming rights under the State of Oklahoma or of Texas, and has brought to the Land Department applications to locate oil claims in the bed of the river and for survey of land alleged to be in the State of Oklahoma and surveyable as public land.

As the Land Department has held heretofore that beds of navigable streams are not subject to disposition under mineral-land laws, the mineral locations have been adjudicated accordingly. The lands on the north bank of Red River have been surveyed and the Red River meandered along the mean high-water mark, according to the public-land system of surveys. After the lands were surveyed and prior to the time when the lands were sold or entered, accretions and erosions occurred along the north bank of Red River. Following the instructions of April 17, 1918 (46 L. D., 461), resurveys have been made along the Red River in the former Big Pasture Reserve and upon filing of the plats the entries will be adjusted to conform to the new surveys. Applications for the survey of land south of the water channel of the river and north of the alleged north boundary line of Texas have not been finally disposed of.

Red River has an average fall along this portion of its course of $3\frac{1}{2}$ to $4\frac{1}{2}$ feet per mile. It flows in a relatively narrow flood plain ranging in width from 1 to $1\frac{1}{2}$ miles, bounded on both sides by bluffs having a maximum elevation of about 175 feet above the river. The river is very broad in comparison with its flood plain. At low water the river bed consists largely of shifting sand, across which narrow, shallow streams meander. (Geological Survey Buls. Nos. 547 (1914), 602 (1915)). This flood plain represents a surface of plantation now in process of formation and susceptible of drilling and prospecting for oil. Whether the boundary line is located at

the water's edge or low-water mark, or at mean high-water mark or at the flood level, or follows the meander of the Texas surveys along the south bluff or bank, it affords considerable area for controversy and litigation, which probably will be taken to the courts for determination.

On behalf of Indian allottees along the north bank of Red River the United States has instituted proceedings for the protection of their rights in the river bed as riparian owners of adjacent land.

DRAFTING AND MAP MAKING.

One of the most important functions of the office is exercised in the preparation of the annual issue of the United States map by which much of the field work of the office for the preceding year is graphically recorded and made accessible to the general public. Each year the progress of public-land surveys, establishment of new national parks and reservations, changes in the boundaries of existing reservations, county-seat locations, new lines of railroads, as well as towns and cities that have attained substantial importance during the year, are faithfully noted in addition to the general basic features of the map. The edition of the 1919 United States map was only 8,519 copies, while that of the 1918 edition was 15,000 copies, the difference being due to increased cost, owing to advanced outlay for labor, muslin, paper, and other materials. The cost of the 1918 edition was $1.04 and that of the 1919 edition $1.90 per map.

The number issued did not permit in either instance of providing the usual number to the Senate and House of Representatives and Commissioner of the General Land Office—7,200, 14,400, and 500, respectively.

The demand for this map is increasing, especially for Government uses; a larger appropriation is desired to provide the required number for Congress and the Commissioner's use.

Owing to the unusual demands upon the drafting force and loss of draftsmen during the war, no State maps were issued during the fiscal year. Maps of Arizona, Oregon, Idaho, Colorado, and Washington have been compiled and are in the hands of the draftsmen for lettering and will be issued during the fiscal year. Maps of Utah and New Mexico are being revised and will be carried through to completion as soon as possible, depending upon the volume of necessary routine work.

The cost of reproducing plats of township survey was increased from $3.60 to $4.50 per set of 23 copies, thus enabling the reproduction of only 1,111 editions as against 1,388 editions in previous year, the majority being reproductions of original plats of recent survey.

There were 9,694 copies of photolithographic township plats disposed of by sale and 14,156 copies furnished this and other departments.

TRACT BOOK NOTATIONS.

The total number of tract-book notations for the present year was 376,151.

This total includes 719 Indian allotments, 12,188 petitions to designate under the acts of February 19, 1909, and December 29, 1916, and 48,079 patents. The number of plats posted was 1,037.

PRELIMINARY EXAMINATIONS.

Homesteads, desert entries, timber and stone applications, etc., 32,193, were given a preliminary examination as to their regularity and validity, of which 24,498 were passed and 7,695 held for further action on account of conflicts and for defects of various kinds.

WITHDRAWN APPLICATIONS.

The number of homestead, timber and stone, and isolated tract applications closed on withdrawal was 6,756, as against 3,252 last year. These were mostly applications under the enlarged-homestead laws.

SUPPLEMENTAL PATENTS.

Supplemental patents under the act of April 14, 1914, were issued in 1,898 cases.

WITHDRAWALS AND CLASSIFICATION.

There were noted the withdrawal of the various tracts included in about 1,000 letters and Executive orders, involving withdrawal for stock driveways, national forests, power-site reserves, classifications, reclamation projects, petroleum reserves, designations under the acts of February 19, 1909, and December 29, 1916, forest-restored lists, etc.

CANCELLATIONS AND RELINQUISHMENTS.

There were canceled during May and June, 306 homestead entries, for failure to make proof within the statutory period, after due notice.

During the year 14,650 entries were canceled on relinquishment.

HOMESTEAD AND KINDRED ENTRIES.

I have commented before on the difficulty experienced by the office in procuring and retaining competent help at the salaries paid in competition with the many war-work activities going on in

Washington and elsewhere. This difficulty, together with the direct loss of many of our most experienced employees who entered the military or naval service, has seriously interfered with our work. In the case of homestead final proofs, the resulting congestion and delay, affecting, as it did, so many people, became so serious as to be considered an emergency. Ten or twelve competent helpers were loaned us by the department and other bureaus; 80 clerks ordinarily engaged exclusively on other work were put on homestead final proofs during the three morning hours; several stenographers were transferred to the patent-writing division. As a result, during the month of June the great bulk of the pending homestead final proofs that had gotton through the accounting and posting divisions, had been acted upon and 14,035 patents, mostly homestead, were issued during the month. This is undoubtedly a record breaker as to patents issued. Special credit is due the patent "boards"—those who check the patents after they are written to see that they are correct in all respects—who worked many extra hours to accomplish this result.

Of course this dislocated the other work of the office somewhat, but it is believed that the end justified the means. In this field of action the following is a summary of the year's work:

Approved for patenting 33,247 homestead entries, on which final three or five year certificates had issued, 2,300 commuted homestead entries, 1,883 final homestead entries within National Forests, 453 timber and stone entries, and 2,248 miscellaneous cash entries, a total for the year of 40,131 against 32,120 of the previous year.

During the year 4,516 final entries were found defective, and the entrymen were required to submit additional evidence; 2,792 applications to make second entries were allowed and 1,097 denied; 1,224 applications to amend were allowed and 270 denied. Applications for sale of isolated tracts approved were 2,108; denied, 713. Applications for extensions of time within which to establish residence, allowed, 755.

Homestead entries canceled because final proofs were not submitted within the statutory period, 2,462; canceled for illegality, 246. Appeals from action of local officers, acted upon, 2,031. Inquiries answered by letter during year, 32,537; by circular, 4,986. Number of requests for circulars complied with, 13,151. Total number of letters and decisions mailed during the year, 58,915.

THE STOCK-RAISING HOMESTEAD.

At the close of the last fiscal year the Land Department was not able to report very substantial progress under the provisions of the act of December 29, 1916 (39 Stat., 862), providing for stock-raising

homesteads, for reasons fully set forth in my last report. At that time some 7,500,000 acres of land had been designated as falling within the descriptive terms of the act, and subject to entry thereunder, and 734 entries had been allowed, embracing an acreage of 236,578 acres.

This year, however, finds the administration of this act, both in the matter of designating lands subject thereto and allowance of entries therefor, in active operation, with the following results accomplished. The area of stock-raising lands designated to date, as reported by the Geological Survey, is 20,181,868 acres. During the year 14,248 petitions were received asking for the designation of lands under the act and 22,000 petitions of such character received favorable consideration. The whole number of petitions filed asking for such designations since the passage of the act is 48,897.

During the fiscal year now past the total number of entries allowed under this act was 15,037, covering an area of 5,559,235 acres. These figures certainly show in a very substantial manner the deep interest that our agricultural people have taken and continue to take in the opportunities offered by this act to small investors in the stock-growing industry.

The act of October 25, 1918 (40 Stat., 1016), amends the original provision of this act; it provides that even though an additional entry be made under the first proviso to section 3 of the act, of land, part or all of which may be incontiguous to claimant's original entry, he may, nevertheless, perform the required period of residence on the tract originally entered, if he continues to own it, it being still stipulated, however, that the additional land must be within 20 miles of the original.

From several sources of advice, it has appeared that undue apprehension exists in some of the mineral sections of the public land field as to the effect of the stock-raising homestead law upon mining claims. It is said that although under the mining laws a valid discovery, followed by location in due form, constitutes an absolute appropriation of the land, that requires no assertion in the local land office until such time as patent may be sought; that under the stock-raising homestead law, which authorizes entries to be made with a reservation to the United States of all the coal and other minerals in the land, valuable mining locations may be included within stock-raising homestead entries without the knowledge of the district land office, or perhaps even of the mining locator himself. It is true the stock-raising homestead act makes provision for the reservation of the minerals, and the right to mine and remove the same under certain restrictions, but the mining locator contemplates with alarm the possibility of his surface rights being substantially

wiped off of the map by the allowance of a homestead entry. The question is therefore asked by those interested in the development of mineral claims whether the stock-raising homestead act operates in any degree to repeal the mining law in so far as it provides for a possessory right in one holding under a valid location.

It should be remembered that our public-land policy has always drawn a sharp line between agricultural and mineral lands, making distinct provisions for acquisition of title to the latter, with special provisions for the protection of the prospector and the miner. There is nothing in the stock-raising homestead law that justifies an inference that Congress had any intention, in the enactment of that law, to depart from its usual policy in dealing with the public land. It did not seem good to Congress to withhold indefinitely, for purposes of mineral exploration, lands that had some agricultural value, and in order that such agricultural value might be utilized it made by this act provision for the disposition of such lands, with a reservation of minerals to the United States. This, however, should not be taken as indicative of any intent to abridge existing rights acquired under the mining law, but may impose upon the holder of a possessory title some additional vigilance in the matter of asserting his claim. It has always been incumbent upon mining claimants of unpatented lands to protect their possessory rights as against adverse claims under the agricultural laws, and the burden will be no greater now under the stock-raising homestead law than heretofore. With any degree of ordinary diligence, mining locators should be fully aware of the assertion of homestead grazing rights in conflict with their mining claims, and, if occasion requires, they should file at the earliest opportunity with the district land office a formal protest, duly corroborated, against the allowance of the agricultural entry without due protection of the mining claim, setting forth in detail the description and character of the land in conflict and the title of the locator thereto, together with a request for a hearing. If this is done, it is not believed that the subsequent proceedings in the Land Department will fail to protect the rights of the mining claimant as fully as though the stock-raising homestead law had not been enacted.

STOCK DRIVEWAYS.

Since my last annual report was submitted, field investigation of the applications of stockmen and recommendations of the Forest Service for stock driveways in Nevada and New Mexico has been completed, and such applications and recommendations in the latter have been disposed of and the greater portion of those in Nevada. The work is completed in South Dakota, and also in Colorado, Montana, Oregon, Washington, and Wyoming, with the exception of pending

investigations of certain recent or incomplete applications, or of areas heretofore temporarily withdrawn for such purpose pending further investigation. A few applications and recommendations remain to be investigated in Arizona, California, and Idaho, the greater number having been disposed of, and field investigation is progressing satisfactorily upon the remaining recommendations and applications in Utah.

Based upon field investigation and my recommendations you have withdrawn under authority of section 10 of the act of December 29, 1916 (39 Stat., 862) during the fiscal year 4,303,727 acres, inclusive of scattered entries or patented tracts, for stock driveway purposes, and 474,782 acres have been released from such withdrawal, including 329,050 acres which had been temporarily withdrawn in 1916 under the act of June 25, 1910 (36 Stat., 847). The total area withdrawn for stock driveway purposes at the close of the fiscal year is 6,623,531 acres, and is distributed by States as follows: Arizona, 394,556 acres; California, 10,990 acres; Colorado, 216,863 acres; Idaho, 494,383 acres; Montana, 187,924 acres; Nevada, 2,803,138 acres; New Mexico, 1,137,799 acres; Oregon, 431,967 acres; South Dakota, 18,320 acres; Utah, 3,252 acres; Washington, 10,719 acres; and Wyoming, 913,620 acres.

SOLDIERS' ADDITIONAL HOMESTEAD RIGHTS.

In my last annual report I submitted a table showing the number of cases pending at the beginning of each fiscal year, for the fiscal years ending June 30, 1910, to June 30, 1918, both inclusive; the number received each year, the number closed, and the number on hand at the end of the fiscal year, from which report it appeared that there were then pending 446 cases. During the present year we have received 369 cases, making in all a total of 815 cases, of which there have been finally adjudicated 327, leaving on hand at the present time 468 cases.

Many of the new applications are based upon assignments of rights made by heirs and administrators of the estates of soldiers prior to the date of the administrative ruling of February 15, 1917 (46 L. D., 32), holding that the soldiers' additional right, although declared to be assignable by the United States Supreme Court (Webster *v.* Luther, 163 U. S., 331), is not descendible, as long held by this office and the department.

It was expressly declared that the ruling would not be treated as retroactive and that sales of rights "wholly completed and formally consummated by actual delivery of the written assignment" prior to the date of the ruling would be recognized.

As numerous negotiations between dealers and beneficiaries were then at various stages of consummation, attempts were made to lo-

cate rights in which the assignment bore a later date, but such were promptly rejected by this office and the decisions sustained by the department.

Since the date of departmental letter to Mr. Francis J. Heney, December 26, 1917 (46 L. D., 274), declining to modify the ruling, the same has been sustained by the Supreme Court of the District of Columbia, in the Frank Hoy mandamus case.

The rights involved in the new applications are to a great extent composed of small fractions which are combined by invoking the rule of approximation so as to obtain title to 40 acres by the location of a little more than 20 acres of scrip and paying the Government price of $1.25 per acre in cash for the excess, in violation of the spirit of the act of March 2, 1889 (25 Stat., 854), prohibiting cash purchases except in the State of Missouri. Moreover, the scrip dealers exact from the locators the scrip price for the whole 40-acre tract, thereby selling something that has only a fictitious existence.

By the administrative ruling of June 13, 1919 (circular No. 648), it was directed that on and after September 1, 1919 "the rule of approximation will no longer be permitted in the location of soldiers' additional homestead rights, whether in their entirety, partly, or in combination with other rights or parts thereof." By order of August 19, 1919, the date when this ruling shall become effective has been extended to December 1, 1919.

More than 60 per cent of said new applications were made for lands in the grazing regions of the States of California, Nevada, and Wyoming, apparently with the view of obtaining control of springs and water holes used by the general public for watering stock grazing on the public range.

All such applications are investigated by the field service of this office and the reports submitted to the Geological Survey for recommendation as to the propriety of the withdrawal of the lands applied for as public water reserves. Many of the tracts have already been withdrawn by Executive orders for public water reserves and the applications rejected, thereby reserving the springs and water holes for the benefit of the general public.

Very few new applications have been received during the fiscal year from Alaska, and many of the cases which were pending in this office located in Alaska have been disposed of by issue of patents.

As most of the applications now received consist of fractional rights and being as many as 24 fractions combined in one application for 40 acres of land, it would appear that the supply of these rights is nearing exhaustion. This is only a guess, however, as more applications were received in this office in the month of July, 1919, than in three months immediately preceding said month.

The two administrative rulings above mentioned, the one holding that the right does not descend and only vests in the soldier during his lifetime, his widow during her widowhood, and his minor children during their minority, and the other abolishing the use of the rule of approximation, will doubtless curtail the tender of these rights.

PREEMPTION ENTRIES.

The act of March 3, 1891 (26 Stat., 1095), repealed the preemption laws except as to existing agreements and treaties with the Indians.

The amount of land subject to preemption has grown less and less each year. No new lands are being opened subject to the preemption laws. Practically all the preemption entries now being made are for lands within the ceded Ute Indian Reservation in western Colorado.

The records of this office show that during the past year there were 69 preemption entries made, as against 128 for the previous year.

TOWN SITE, TOWN LOT, AND KINDRED ENTRIES.

Although the war continued well into the fiscal year ending June 30, 1919, it appeared to have little effect in diminishing the demand for town sites and town lots, and following the armistice, such demand increased.

Nineteen town-site and kindred entries were received during the year, amounting, with the 4 pending at the beginning of the year, to 23, of which number 20 have been approved for patenting, leaving 3 pending.

There were pending at the beginning of the fiscal year 112 lot entries and received during the year, 1,208, making a total of 1,320 lot entries, of which number 1,251 were approved for patenting, leaving 69 pending at the end of the year. These entries include 1,288 lots.

During the fiscal year there has been received for the sale of town lots outside of Alaska, $112,871.30. The receipts from sales of lots in the town sites in Alaska under the act of March 12, 1914 (38 Stat., 305), amount to the sum of $28,099.65. There have also been lot sales in the town sites of Wrangell, Haines, and Douglas, Alaska, under the act of March 3, 1891 (26 Stat., 1095). The town sites of Haines and Douglas have been closed and all of the lots therein disposed of, the proceeds from Douglas amounting to $1,257.06, and the proceeds from Haines amounting to $2,118.20. The trust for the town site of Wrangell has not been completed. The town site of Petersburg has also been entered under the same act and the survey into lots and blocks has been made, but no sales of lots have as yet taken place.

RIGHTS OF WAY.

Many things have militated against a large year in the right of way section. The war; the scarcity of engineers, and skilled help for engineers, due to war conditions; scarcity of labor for construction; the practical impossibility of interesting capital in anything but war work; the hesitancy of the Government to authorize any railroad construction not necessary to the war-time needs of the Government; the indisposition of promoters and other interested persons to invest, even in surveys and reconnoisances pending some definite conclusion of the war, and establishment of prewar conditions and policies have all tended toward a restriction of the class of construction for which rights of way under the public-land laws are needed. But notwithstanding these conditions the right of way section is in much better shape this year than last.

During the year there have been received 430 applications of all kinds, of which 81 were for railroad rights of way and 349 for "all others" (excepting hydroelectric-power projects).

Forfeiture.—Clearing the records of approved right of way applications where there has been no construction within the statutory period, whether by relinquishment or by judicial proceedings to declare forfeiture, is logically part of the right of way work, and should be considered in connection therewith. During the past year 185 cases have been docketed and acted upon, as against 82 last year. One hundred and five cases have been finally disposed of, as against 104 last year, of which number 9 were declared forfeited by decree of court after judicial proceedings, and the balance by relinquishment, or otherwise.

In this connection I call attention to the recommendations in my report of last year that appropriate forfeiture legislation be enacted by Congress. It is not deemed necessary to repeat the reasons therefor, which were fully discussed in said report.

STATE IRRIGATION DISTRICTS.

In accordance with the act of August 11, 1916 (39 Stat., 506), and the regulations thereunder of March 6, 1918, there have been filed five applications (three in California, one in Oregon, and one in Idaho) involving 131,148 acres of land which it is sought to bring under the taxing power of the State, through the approval of the applications by the Secretary of the Interior.

These applications, as they were received, were promptly transmitted to the field for investigation, and the field work connected therewith has been completed upon four of the projects, and the fifth will be completed during the present field season. Full reports

have not as yet been filed, however, so that in none of the cases has final action been taken.

I am advised that a number of other irrigation districts have been prevented from filing applications only because of the scarcity of engineering and other help necessary to the preparation and compilation of proper data, but that this is nearly ready, and the applications may be looked for during the coming year.

PRIVATE IRRIGATION PROJECTS.

During the past fiscal year 61 new reports and 28 supplemental reports have been received as the result of investigations of private irrigation enterprises and irrigation districts upon which claimants and applicants under the desert-land laws were dependent for their water supplies, making a total of 978 projects reported on since the adoption of the regulations of September 30, 1910 (39 L. D., 253). There were also received from the Director of the Geological Survey 70 reports made in response to requests of this office for information bearing upon the question of the feasibility of these projects.

During the year reports on 92 irrigation companies and irrigation districts have been considered and disposed of by this office. In 47 cases, affecting approximately 288 desert-land claims, the conclusions reached were in favor of the recognition of the company or district as a proper source of water supply for the irrigation of desert lands; in 28 cases, affecting 58 entries and applications, the conclusions were adverse; while 17 cases were closed without any definite conclusion having been reached, it appearing that there were no longer any desert-land entries or applications involved, all having been relinquished or otherwise disposed of. Of the reports considered there were five, two favorable and three adverse, which involved projects previously acted upon, and the last action taken was for the purpose of revising or supplementing the previous action. These five projects involved about 60 desert-land entries and applications.

The office also considered and temporarily suspended action upon 12 projects pending the receipt of supplemental reports from the Field Service. Action was likewise suspended on 47 projects pending receipt of reports by the Geological Survey, called for by this office in accordance with departmental regulations.

On July 1, 1919, there were 87 reports awaiting action by this office and 14 were awaiting action in the survey by the Field Service, or by the applicants, the latter class consisting for the most part of cases in which this office had requested the Geological Survey to furnish information relative to the feasibility of the project under investigation or had directed that supplemental investigations or reports be made by the Field Service.

The latest information received indicates that, including the above-mentioned class of supplemental work, there are approximately 172 of these irrigation project cases awaiting investigation or report by the Field Service.

HYDROELECTRIC POWER.

The failure of passage of the so-called water-power bill has militated against hydroelectric power development, all of the companies postponing extensions so far as possible, awaiting the passage of the bill, or final indication that such action will not be taken.

During the past fiscal year permits were granted the following-named parties under the provisions of the act of February 15, 1901 (31 Stat., 790), to wit:

Nevada Valleys Power Co., power transmission lines in Nevada.

Arizona Gas & Electric Co., power transmission lines in Arizona.

There were also granted several permits for power projects of less than 100 horsepower capacity and permits for power projects to be used by municipalities. No charge is made for the use of public lands under such permits.

During the same period grants of right of way (easements) were made to the following-named parties, pursuant to the provisions of the act of March 4, 1911 (36 Stat., 1253–1254), to wit:

Southern Sierras Power Co., power transmission lines in California.

Southern California Edison Co., power transmission lines in California.

Montana Power Co., power transmission lines in Montana.

Arizona Power Co., power transmission lines in Arizona.

Black Rock Power & Irrigation Co., power transmission line in Washington.

Gila Copper Sulphide Co., power transmission in Arizona.

Western Colorado Power Co., power transmission lines in Colorado.

During the year the following payments were made by the parties named as compensation for the use of Interior Department lands under permits and grants made to them for hydroelectric power development, power-transmission lines, etc.:

Great Falls Power Co	$530.00
Truckee River General Electric Co	70.28
Mountain King Mining Co	105.00
Fremont Power Co	0.51
Mount Konocti Light & Power Co	1.39
Chicago, Milwaukee & St. Paul Railway Co	75.00
Southern Sierras Power Co	1,360.00
Southern California Edison Co	197.50
Montana Power Co	817.00

Elko-Lamville Power Co	$35.00
Mission Range Power Co	66.00
Vernal Milling & Light Co	150.00
Nevada Valleys Power Co	270.00
Alaska Gastineau Mining Co	2,320.00
Washington Water Power Co	20.00
Calumet & Arizona Mining Co	20.00
New Cornelea Copper Co	30.00
Black Rock Power & Irrigation Co	35.00
Gila Copper Sulphide Co	15.00
Wilfony Power Project	6.39
Arizona Gas & Electric Co	30.00
Arizona Power Co	565.00
Western Colorado Power Co	1,418.00
Total	$8,137.07

CAREY ACT.

The condition of the Carey Act work is satisfactory and on the whole shows a material improvement over last year.

July 1, 1918, applications for patent were pending aggregating 249,827 acres; received during the year 14,706 acres; totaling 264,533 acres. Of this amount 85,699 acres were patented and 5,468 acres canceled, leaving 173,365 acres pending June 30, 1919, of which 158,792 acres are awaiting action elsewhere and but 14,573 acres awaiting office action.

The inroads made upon segregation applications was marked. On July 1, 1918, 1,014,881 acres were awaiting action. During the year 511,505 acres have been finally disposed of, leaving but 503,375 acres pending, of which 472,103 acres are awaiting response to calls, and but 31,272 acres actually awaiting office action. Withdrawals and segregations were made during the year totaling 3,532 acres, and there was restored to entry during the same period lands theretofore withdrawn or segregated totaling 565,899 acres. Time for reclamation was extended upon segregations aggregating 28,812 acres, and 19,715 acres were canceled from segregations which had run the statutory period. July 1, 1918, the area under all forms of Carey Act applications totaled 1,991,698 acres. June 30, 1919, such acreage totaled 1,713,404 acres, of which 1,655,435 acres were pending response to calls, leaving but 57,969 acres actually pending office action.

DESERT LANDS.

During the past year a total of 7,365 desert-land cases of all kinds were received for action or adjudication, divided as follows: Desert applications, 628; applications for reinstatement, 41; original desert-land entries, 1,723; applications for second desert-land entries, 49;

annual proofs, 1,237; assignments of desert-land entries, 112; extension of time to make final proof, 1,032; applications to amend, 52; final desert-land entries, 1,548; applications under the act of March 3, 1909 (35 Stat., 779), 9; applications for relief, 934.

The total number of cases finally disposed of was 6,672, of which 1,567 were final desert-land entries. One thousand six hundred and seventy-five final desert-land entries were patented, involving 267,065.22 acres.

TEN CHAIN LOTS.

Nine applications under the act of March 3, 1909, were received during the year, making a total of 65 such applications. Of these, 28 were approved and 4 canceled, leaving 33 pending, of which number 22 are awaiting response to calls.

RECLAMATION HOMESTEADS.

During the past year 381 assignments of homestead entries within Government reclamation projects were examined and accepted; additional evidence was required in 86 cases, and 8 of such assignments were rejected. Seven hundred and thirteen original homestead entries in such projects were examined and accepted; additional evidence was required in 137 cases; 55 of such entries were canceled by this office, and 65 were closed by relinquishment of the entrymen. Six hundred and fifty-three final homestead entries, under the reclamation act of June 17, 1902, were approved for patenting; additional evidence was required on 47 of such entries and 3 were canceled.

There were no large openings of farm units in Government reclamation projects during the past year. However, a large area, comprising about 23,000 acres formerly embraced in the Sun River project, Montana, was restored to homestead entry on April 7, 1919, and to all other proper forms of entry on April 14, 1919. These lands were eagerly sought by claimants by reason of their favorable location, some tracts being situated within a few miles of the city of Great Falls, Mont.

Withdrawals were made during the fiscal year for the following proposed projects: Sentinel project, Arizona; Bruneau and Mountain Home projects, Idaho; Oregon Basin project, or unit, and Riverton (Indian) project, Wyoming. The feasibility of these projects is a matter for the investigation and consideration of the Reclamation Service; at present they are merely prospective.

During said fiscal year this office promulgated 43 withdrawals under the reclamation act, and 60 restorations of lands formerly withdrawn thereunder. The total area of lands withdrawn under said act during the year was 3,868,840 acres, while the area restored during the same period was 120,240 acres.

STOCK-WATERING RESERVOIRS.

July 1, 1918, 166 stock-watering reservoir applications were pending action; 362 were received or docketed during the year. Of these 20 were approved, 77 canceled, and 235 otherwise disposed of, leaving 205 pending June 30, 1919, of which 133 are awaiting response to calls and 72 pending office action.

WITHDRAWALS AND RESTORATIONS.

During the past year 9,793,525 acres of public land were withdrawn or placed in a state of reservation under the various acts applicable thereto and 4,978,103 acres theretofore withdrawn have been restored.

Some of the withdrawals overlap in part former withdrawals for other purposes, and some are in the form of blanket withdrawals, without strict regard to lands entered or applied for, so that the total of withdrawn lands does not represent accurately the amount of public enterable lands withdrawn. The same may be said of restorations. Some lands restored were included in other forms of withdrawals, and so did not become open to entry or other disposition, and some restorations were made because the lands restored were patented or covered by entries.

The withdrawals and restorations during the year were as follows:

Stock driveways.—Under section 10 of the act of December 29, 1916 (39 Stat., 862), 4,303,727 acres have been withdrawn and 474,782 acres released from former withdrawals.

National forests.—Forty-nine thousand nine hundred and ninety-five acres of public lands, 10,761 acres thereof being revested Oregon and California railroad lands, have been added to national forests, and the public lands in 580,508 acres have been withdrawn under the act of June 25, 1910 (36 Stat., 847), for forest purposes or in aid of forest-reservation legislation. The public lands in 1,049,063 acres excluded from national forests and in 166,875 acres released from withdrawals for forest purposes have been restored to entry and other disposition.

National parks.—Approximately 606,720 acres theretofore reserved for national forest purposes were set apart by the act of February 26, 1919 (40 Stat., 1175), as the Grand Canyon National Park. Considerable areas within national forest boundaries were withdrawn by Executive orders under the act of June 25, 1910 (36 Stat., 847), in aid of pending legislation to enlarge the Sequoia National Park in California and the Yellowstone National Park in Wyoming.

Coal, petroleum, oil shale, and potash.—Two thousand four hundred and fifty-five acres were withdrawn for coal classification and 2,563,561 acres previously withdrawn have been restored, of which

2,563,401 acres were classified and appraised as coal land; 233,521 acres were withdrawn for oil shale and 440 acres previously withdrawn for potash have been restored.

Power site.—By 20 Executive orders there have been withdrawn 17,200 acres for hydroelectric power-site and transmission-line purposes, and by 23 orders 16,037 acres heretofore withdrawn have been restored.

Public water reserves.—Eleven Executive orders withdrew 22,422 acres of public land as public water reserves, and 975 acres were restored by 6 orders of restoration.

Reclamation.—Under the reclamation act of June 17, 1902 (32 Stat., 388), 3,868,840 acres were withdrawn by 43 withdrawal orders, and 120,240 acres were restored by 60 restoration orders.

Carey Act.—Under the act of August 18, 1894 (28 Stat., 372), section 4, and acts amendatory of and supplementary thereto, there have been withdrawn or segregated to the various States 4,532 acres, and restored from such withdrawals and segregations 565,899 acres.

Miscellaneous.—In Alaska 37,120 acres are withdrawn under the act of June 25, 1910 (36 Stat., 847), for the purpose of supplying aeroplane timber, and 3,140 acres were withdrawn under the Alaska railroad act of March 12, 1914 (36 Stat., 305), for park and watershed protection purposes in connection with the town site of Anchorage, and 19,600 acres theretofore withdrawn for classification were restored. In aid of pending or proposed legislation, 2,868 acres in Idaho and 38,590 acres in Montana were withdrawn under the act of June 25, 1910 (36 Stat., 847), and 2,236 acres in Wyoming were released from a former withdrawal for such purpose. In Wyoming 19,000 acres were withdrawn as Indian power-site reserve.

STATE SELECTIONS AND STATE GRANTS.

Indemnity school-land selections aggregating 472,090.33 acres, and selections under grants in quantity for specific purposes embracing 87,080.04 acres were received during the past fiscal year. There were certified to the States during the same period, 1,277,909.11 acres of indemnity school land and 350,925.46 acres of specific quantity grant land. In addition, 32,971.48 acres of indemnity school land and 7,220.22 acres of quantity grant selections were rejected and canceled, the total acreage adjudicated being 1,669,026.27. There were 53,025.12 acres of land certified to the States with reservations of mineral deposits (coal, oil, and gas, phosphate, nitrogen) to the United States under the provisions of the acts of Congress of March 3, 1909 (35 Stat., 844), June 22, 1910 (36 Stat., 583), and July 17, 1914 (38 Stat., 509).

As mentioned in my report last year, cooperative agreements have been entered into between the United States and some of the States,

under which school-section lands within the boundaries of national forests are exchanged for other lands within national forest boundaries, the lands selected by the States, upon confirmation of title, being eliminated from the forests. During the past year 21,262.17 acres of such exchange agreement selections received departmental approval, the total so far confirmed to the States pursuant to these agreements aggregating 203,750.80 acres. This method of adjustment results in consolidation of Federal and State holdings, permits the States to secure lands not otherwise subject to selection by them, and to the extent to which the exchanges are consummated relieves lands being sought by homeseekers from State claims. Approximately 100,000 acres of these exchange agreement selections were filed during the past year.

During the fiscal year 1918, 2,333,811.67 acres of State selections were adjudicated and 1,233,926.01 acres in 1917.

THE STATE OF WASHINGTON GRANT AND AGREEMENT.

The grant of school lands to the State of Washington is found in the act of February 22, 1889 (25 Stat., 676). No provision is made therein for selection of lands in lieu of school-section lands within reservation boundaries. The act of February 28, 1891 (26 Stat., 796), provides for such lieu selections and also for the protection of claims of those who settle in good faith before field survey on lands which when identified by survey are found to be portions of designated school sections. This act of 1891 has been construed for many years by the Federal Land Department as a general adjustment act applicable to all States having grants of public lands for school purposes at the date of its passage. To the same effect is the decision of the United States Supreme Court in the case of the State of California *v.* Deseret Water, Oil & Irrigation Co. (243 U. S., 415). Prior thereto, however, the Supreme Court of the State of Washington had placed a different construction upon the statute of 1891, supra, holding that Congress could not by subsequent enactment restrict or change the grant made by the State's enabling act of February 22, 1889, above mentioned. (State of Washington *v.* Whitney; 66 Wash., 473; 120 Pac. Rep., 116.) The result is that while there is full Federal authority to adjudicate selections made by the State of Washington under the provisions of the said act of 1891, officials of that State are not in position to invoke that statute for the purpose of adjusting the State's school-land grant. The matter was fully and carefully considered, through correspondence and orally, and on May 17, 1919, representatives of the State agreed to—

institute, or cause to be instituted and prosecuted, to the supreme court of the State, and if deemed advisable to the Supreme Court of the United States, without delay, such legal actions as may be appropriate to obtain decisions to

the effect (*a*) that the State of Washington is entitled to select indemnity lands under the provisions of the above act of February 28, 1891, and (*b*) that under the existing laws of the State the board of State land commissioners is empowered to make selections under said act. In the event, however, of the failure to obtain such a decision the officers of the State undertake to procure the passage by the State legislature of an act conferring authority to make such selections and ratifying selections heretofore made.

Adjudication of some 85,000 acres of selections of the State of Washington is withheld pending action by the State pursuant to said agreement.

NEW MEXICO LITIGATION.

Questions of material interest to several of the public land States and to the Land Department are presented in a suit brought by the State of New Mexico against the Secretary of the Interior and the Commissioner of the General Land Office, now pending before the Supreme Court of the United States. The State selected land in lieu of a tract of school-section land owned by it, situated within the outboundaries of a national forest. The lines of the forest were afterwards changed so that the tract of school-section land was no longer within national-forest boundaries. The Land Department rejected and canceled the selection on the ground that the elimination of the school-section tract from the forest boundaries removed the condition upon which depended the right of the State to offer the tract in exchange and that authority to complete the proposed exchange by approval of the selection no longer existed. The State contends that when adverse action was taken it had a completed selection; that all requirements and regulations of the Land Department had been met; in effect that the exchange had been consummated, and that the Land Department was without authority to question in any way the right and claim of the State in and to the selected land. Decision by the court of last resort is awaited.

SUGGESTED LEGISLATION.

I have had occasion to comment heretofore on conditions existing in several of the States with respect to titles to designated school-section lands. The grants of these designated school sections call for no further evidence of title, the statutes being both grants and conveyances, if the lands are of the class and character intended to be granted. As a rule, mineral lands do not pass under these grants. In other words, if the lands were of known mineral value at date of grant, as to lands then surveyed, and at date of the acceptance of the survey by the Federal Land Department, as to lands unsurveyed at date of grant, they do not pass to the State, but remain the property of the United States. Until determination is had, it may be

as a result of costly and vexatious litigation, the title remains in doubt. If the States sell such lands, the claims of title of their purchasers may be defeated on proof of the known mineral character of the land at the time the grant would have otherwise become effective. The case of the United States *v.* Sweet (245 U. S., 563), is one directly in point. To meet this condition, I renew the recommendation made in last year's report, that so far as such lands have been heretofore identified by survey, Congress should, by appropriate statute, authorize a patent to the purchaser in good faith from the State, with reservation of the mineral deposits in the land to the United States, if the purchaser so elect, or a patent without such reservation on the payment of the appraised price of the land. As to lands being surveyed from time to time every effort is being made in connection with the surveys in the field and their subsequent approval, to remove uncertainty of title under school-land grants so far as affected by mineral deposits.

RAILROAD GRANTS.

Railroad and wagon road selections were received during the year to the amount of 529,900.03 acres, as against 665,372.49 in 1918.

There were patented 632,284.40 acres, as against 943,399.78 acres patented in 1918.

As during the year 1918, the pressure of other work, particularly that made necessary by the Oregon and California revestment act of June 9, 1916 (39 Stat., 218), has retarded the work of adjusting the railroad and wagon road grants. Another contributing factor was the loss of two examiners engaged in this work, who have not yet been replaced by other competent and experienced clerks.

The suits mentioned in the report of 1917, of the Central Pacific and Northern Pacific Railway Cos., to test the right of the Government to withdraw from disposition lands within the railway indemnity limits included in pending unapproved indemnity selections and of the Northern Pacific Railway Co. to determine what constitutes a mineral classification under the act of March 2, 1899 (30 Stat., 993), are still pending in the courts.

NEW ORLEANS PACIFIC RAILWAY LANDS.

Suit has been pending in the United States Court for the Western District of Louisiana for a great many years, having for its object the recovery of the title to certain lands held to be excepted from the operation of the grant by act of March 3, 1871 (16 Stat., 573), as confirmed by the act of February 8, 1887 (24 Stat., 391), because occupied by actual settlers at date of definite location and, therefore, within the terms of the proviso to section 2 of the act last mentioned.

New suits were instituted in 1915 in some of the cases, of which several test cases were carried to the Supreme Court of the United States. A decision was rendered by the court on January 27, 1919 (39 Sup. Ct. Rep., 175), in which it was held, among other things, that lands occupied by actual settlers at the date of the definite location of the road were excepted from the operation of the grant by virtue of the provisions of the act of 1887; that where said lands were patented, it became the duty of the railway company to surrender the title; that where they were unpatented, the law forbade the issuance of patents to the company for them; that intending purchasers were bound to take notice of the occupancy of settlers; that this, with the act of 1887, rendered untenable the claim that those who held title under the patents have the status of bona fide purchasers; that, under these circumstances, the settlers whose claims came within the proviso to section 2, and the latter part of section 6 of said act of 1887, were entitled to have a trust in their favor declared and enforced, and that the United States was a proper party in interest, entitled to institute suits to have purchasers from the railway company declared trustees for the benefit of the settler claimants and to enforce reconveyance of title for their benefit.

Legislation for the benefit of settler claimants had been introduced in several recent Congresses but, as it was believed that under said decision further legislation was unnecessary, procedure was formulated to enable settlers to establish their claims.

When a claim is brought to the attention of the office which appears to come within the terms of the Supreme Court decision, a hearing is ordered to enable the claimant to establish the facts in his case, to be had after proper notice to the railway company, or its successors in interest, according them an opportunity to appear and contest the claim of the settler. If it shall be determined that the claim of the settler is superior to that of the railway company and its transferees, request will then be made upon the railway company or its transferees for the reconveyance of title to the United States or directly to the settler claimant. If reconveyance is refused, it will then become necessary to have suit instituted to compel the railway company or its transferees to convey the land to the settler claimant, or to reconvey to the United States in cases where suit to vacate the patent is barred by the act of March 2, 1896 (29 Stat., 42), or to institute suit for the cancellation of the patent where that form of action has not been barred by said act.

A number of applications for consideration of claims have been filed which have not yet been reached for consideration, except in a few instances, owing to the pressure of other more urgent matters. It is expected that these cases will all be disposed of during the coming year.

COOS BAY WAGON ROAD LANDS.

The suit referred to in the report of 1918 as having been instituted against the Southern Oregon Co. as successor in interest under the grant to the State of Oregon by the act of March 3, 1869 (15 Stat., 340), commonly known as the Coos Bay wagon road grant, to secure a forfeiture of the grant as to about 93,000 acres of land disposed of in violation of the proviso to section 1 with reference to the sale of the lands, was terminated by the passage of the act of February 26, 1919 (40 Stat., 1197). The act provides for the execution and delivery by the Southern Oregon Co. to the United States of a deed reconveying to it all the right, title, and interest of said company in and to the lands involved and the acceptance of said deed by the Attorney General whereupon the lands shall again become part of the public domain. It is provided that the United States shall pay to said Southern Oregon Co. the sum of $232,463 and shall also pay the taxes due and accrued, estimated at $547,486.99, including interest, penalties, and costs, at this time. The act further provides that the lands shall be classified and disposed of in the manner provided by the act of June 9, 1916 (39 Stat., 218), for the classification and disposition of the lands formerly included in the Oregon & California Railroad grant.

On February 27, 1919, the Southern Oregon Co. executed its deed reconveying the lands involved in the suit to the United States, which was delivered to and accepted by the Attorney General on March 10, 1919. The work of classifying the lands into the three classes, viz, power-site lands, timber lands, and agricultural lands, contemplated by the act, is being prosecuted vigorously to the end that at as early a date as practicable the lands available for agricultural entry may be restored as provided by said act; while the ascertainment of the taxes due is well in hand, and the payment thereof will probably be made before this report is in print.

SETTLERS ON RAILROAD LANDS IN MONTANA.

The act of Congress approved February 28, 1919 (40 Stat., 1204), provides that in the adjustment of the grants made to the Northern Pacific Railroad Co., if any of the lands in the indemnity limits through that portion of the former reservation for the Gros Ventre and other Indians, lying south of the Missouri River in the State of Montana, which have been adjudged by the Secretary of the Interior to inure to the Northern Pacific Railway Co. as successor in interest to said Northern Pacific Railroad Co., be found to be in possession of actual bona fide qualified homestead settlers who have placed valuable improvements thereon, the Northern Pacific Railway Co., upon the request of the Secretary of the Interior, may file relinquish-

ments in favor of the settlers and shall then be entitled to select an equal quantity of other lands in lieu thereof from any of the surveyed public lands in the State of Montana, not mineral and not otherwise appropriated at the date of selection. Regulations under this act were approved May 2, 1919, and approximately 60 cases have been reported as subject to the provisions of the act. These cases are being examined as rapidly as possible and requests made of the railway company to relinquish the lands for the benefit of the settlers. The act is not mandatory in character, but depends for its effect upon the concurrent action of the railway company, the Land Department, and the settlers affected thereby.

THE DALLES MILITARY ROAD ADJUSTMENT.

By departmental decision, dated January 24, 1917 (45 L. D., 613), in the adjustment of the grant made to the State of Oregon by the act of February 25, 1867 (14 Stat., 409), to aid in the construction of The Dalles Military Road, it was held that the actual location of the road as constructed defined the limits of the grant and not the diagram theretofore used in adjusting claims thereunder; that upon this basis the company was entitled to select the existing deficiency based thereon, to wit, 36,066.55 acres, first, from vacant, unappropriated, public lands in place limits as thus ascertained, and then from vacant, unappropriated public lands within the indemnity limits as so ascertained.

The Dalles Military Road Co. and the Eastern Oregon Land Co., successors in interest thereto, both filed, in due form, their acquiescence in the adjustment of the grant upon the basis set forth in said decision. On November 6, 1917, the department further held that selections in the primary limits to make up said quantity of 36,066.55 acres, might be made within the Malheur, Ochoco, and Whitman National Forests. By departmental letter dated April 30, 1919, resident attorneys for the Eastern Oregon Land Co. were advised that all selections under this grant must be filed on or prior to July 31, 1919, and that the grant will be closed upon the basis of selections filed by that time.

At the date of said decision of January 24, 1917, there were pending in this office selections filed by The Dalles Military Road Co. amounting to 7,352.15 acres, 1,019.20 acres of which are within the indemnity limits. Subsequent to the date of the decision, the company filed selections for 18,917.73 acres, all within the primary limits; 16,972.73 acres, within the primary limits, were included in a list approved by the department, June 16, 1919, upon which patent has not yet been issued.

A report has recently been received from the Geological Survey recommending a field examination as to a large part of the 9,297.15

acres of pending selections submitted to it for report. There remain to be selected in full satisfaction of the quantity of 36,066.55 acres above stated, 9,796.67 acres. As action upon the selections in the indemnity limits must, under said decision of January 24, 1917, necessarily be suspended until selections of all the available lands in the primary limits are adjusted and disposed of, it is probable that some modification of the ruling of April 30, 1919, will be necessary in order to make the requisite field examination of the primary land recommended by the Geological Survey and to permit the company to make selections to replace lands found to be mineral in character and otherwise excepted from the operations of the grant.

OREGON AND CALIFORNIA RAILROAD LANDS.

The act of June 9, 1916 (39 Stat., 218), revested in the United States all of the lands patented to the Oregon & California Railroad Co. under the grants by acts of July 25, 1866 (14 Stat., 239), and May 4, 1870 (16 Stat., 94), and the lands to which it was entitled to receive patent under said grants, which remained unsold July 1, 1913.

In my report for the year 1918, there were set forth in detail the various steps taken in the administration of the revested lands.

Practically all of the lands revested in the United States have been classified except the unpatented lands in the primary limits within forest reserves, surveyed and unsurveyed, which remained unsold on July 1, 1913, to which the company was entitled to receive patent, approximately 400,000 acres, although this area will be reduced to the extent that the lands are found to be mineral in character. About 472,000 acres, of which 318,000 acres are unsurveyed, in the indemnity limits within national forests, are also unclassified. Under the present rulings of the department, the right of selection by the company of these lands is defeated. The question raised of the right to include within a reservation for forest purposes lands embraced within the indemnity limits of a railway grant and so defeat the right of selection, pending in the Court of Appeals, District of Columbia, in the case of Franklin K. Lane *v.* Northern Pacific Railway Co., is still undetermined.

Under the adjustment required by the revestment act to ascertain the full and complete quantity of land for which the company was entitled to receive $2.50 per acre, it became necessary to survey approximately 182,000 acres of land in the primary limits and in the indemnity limits outside of forest reserves, which survey is now nearly completed.

The examination in the field of odd-numbered sections apparently subject to the grant also became necessary, for mineral lands,

except coal and iron, were excluded from the grant. About 55,000 acres were found to be apparently mineral and proceedings to determine their mineral or nonmineral character are pending.

As stated in the report for 1918, two restorations were made of lands classified as agricultural, 300,000 acres in the Roseburg district by regulations approved March 19, 1918, and about 150,000 acres in the Portland district by regulations approved May 11, 1918. Maps or diagrams showing the tracts subject to entry were prepared in connection with the circulars of regulations.

Preparations are being made for the restoration to entry of some 350,000 acres, classified as agricultural in the Roseburg district, mostly between the northern line of the area restored on March 19, 1918, and the southern line of the area restored May 11, 1918, which line is also the line between the Roseburg and Portland land districts.

At the time of the former openings, objections were made by some of the people of Oregon who desired that such openings be deferred until after the conclusion of the war, in order to afford returning soldiers an opportunity to make entry. Subsequently, a movement was started by which it was proposed to accord to soldiers a preference right of entry for a limited period in all openings or restorations of lands to entry, but Congress adjourned on March 4, 1919, without enacting such legislation. If it is desired to accord to soldiers a preference right of entry of these revested railroad lands, further legislation will be necessary and the opening of these lands may be deferred in order to give to Congress an opportunity to enact appropriate legislation.

In the disposition of timber on these revested lands, on September 17, 1917, regulations were approved providing for the sale of the timber on certain isolated tracts where it appeared to be to the advantage of the United States to dispose of the same at a fair value. During the year 1918, patents were issued for the timber on 4,197.89 acres, for which there was received the sum of $145,888.28. During the present fiscal year the timber was sold on isolated tracts, aggregating 2,875.76 acres, containing 65,414,000 feet, board measure, of timber, for which there was received the sum of $96,497.83.

On May 31, 1918, Congress passed an act authorizing the Secretary of the Interior, in the administration of the act of June 9, 1916, to exchange revested Oregon & California Railroad lands for other lands of approximately equal aggregate value held in private ownership either within or contiguous to the former limits of the railroad grant, when by such action he would be enabled advantageously to consolidate the holdings of timber lands by the United States. Regulations under this act were approved July 17, 1918. The advantageous features of such consolidations were set out in my report for the year 1918.

A number of applications, 22, proposing exchanges under this act, involving approximately 80,000 acres of land, were received, of which several were rejected, as not affording an advantageous consolidation of acreage within the meaning of the act. Among the larger applications may be mentioned those of the Coos Bay Lumber Co., Pillsbury Lumber Co., Weyerhaeuser Timber Co., Nehalem Timber & Logging Co., and Duncan Brewer Lumber Co. In some of these applications, upon preliminary examination it was found that among the tracts selected, as well as those offered in exchange, there were tracts which, in addition to their timber value, had also a potential value for power purposes. An arrangement has recently been effected, in conjunction with the Director of the Geological Survey, and upon the deposit of the estimated cost thereof by the applicants under the circular of regulations, approved July 17, 1918, for the examination of these tracts in the field for the purpose of determining if their chief value is their power or timber value, and if there should be a reclassification thereof removing them from the list of lands classified as chiefly valuable for power-site purposes.

On July 16, 1919, the Nehalem Timber & Logging Co. completed payment under its contract entered into October 22, 1914, whereunder it purchased, pursuant to an order of the United States district court, the timber on certain lands which were then involved in the Oregon & California Railroad grant suit. The contract price was $192,498.13, and the Government has now received a total amount of $202,263.43 from said company, which represents the contract price, together with interest from the depositary where it was for a time held in escrow. The final payment was $9,601.01. The company is given until June 10, 1920, to complete the cutting and removal of the timber. The chief of Field Division of the General Land Office at Portland, Oreg., has had supervision over the matter, he having been appointed by the court a commissioner for the purpose.

SWAMP AND OVERFLOWED LANDS.

The adjustment of the grant of swamp and overflowed lands made to 15 of the public-land States by the acts of March 2, 1849 (9 Stat., 352), September 28, 1850 (9 Stat., 519), and March 12, 1860 (12 Stat., 3) is making progress.

Correspondence with State officials and private inquirers about swamp lands calls for considerable labor. Documents filed in old cases have to be found, and decisions rendered in them have to be hunted up, in order that the facts may be stated and the full information desired, be given.

During the past year new claims for 1,829.34 acres under this grant were filed and old claims to 23,960.74 acres were rejected.

Swamp-land patents issued as follows: To Alabama, 2 patents, for 113.39 acres; to California, 7, for 2,019.43 acres; to Iowa, 1, for 40 acres; to Louisiana, 7, for 4,802.93 acres; to Michigan, 1, for 40 acres; to Minnesota, 1, for 40 acres; to Mississippi, 2, for 886.44 acres; and to Wisconsin, 1, for 21.60 acres. The total area patented was 7,963.79 acres.

The total area conveyed to the several States which were the beneficiaries of this grant up to July 1, 1919, is 63,906,694.83 acres.

The Department of Justice advised on April 14, 1919, that a suit in equity, styled United States of America *v.* Riviera Realty Co., had been brought in the United States District Court of Mississippi to quiet title in the plaintiff to the E. ½ sec. 24, T. 6 S., R. 6 W., S.S.M., Mississippi. This suit will involve a construction of the so-called McLaurin Act of March 3, 1905 (33 Stat., 1258) which confirms certain sales made by the State under claim of right to the lands by virtue of the swamp-land grant.

The enactment of remedial legislation to put an end to vexatious litigation and to quiet the title of persons who claim to own agricultural lands under direct or mesne conveyance from any of the swamp-land States, which was urged in my report of last year, is again recommended. It is suggested that these transferees be permitted to purchase from the United States the tracts they so hold under color of title at the minimum price for public lands: *Provided*, That the sales by the States are evidenced by State deed or patent issued prior to January 1, 1910; that if the lands have been entered in good faith by a settler under the homestead law, he shall be compensated for his improvements; and that, in States where the mineral laws apply, title to the surface only may be acquired.

This grant has now been in course of administration for about 69 years. As the States which were its beneficiaries have had ample opportunity to present claim to all the lands they were entitled to thereunder; as most of them have received about all that belongs to them under it; as it is increasingly difficult to get trustworthy testimony to prove what was the character of lands more than half a century ago; and as the grant should come to a close some time, the recommendation made by me in former reports that legislation be enacted declaring that after a fixed date, preferably six months after the passage of the act, no new claim to swamp and overflowed lands made by any State should be received and recognized by the Government's land department, is again renewed.

PRIVATE LAND CLAIMS.

In the several treaties and agreements by which the public domain of the United States has been acquired provision has been made for the confirmation and fulfillment of the obligations of the former

Government for unperfected claims to land. The United States having obligated itself to make good outstanding obligations to the extent specified in the several treaties, the territory acquired under each treaty has formed the basis for a series of special acts of Congress, limited in their operation to a particular district or territory, and these rights are known as private land claims.

Numerous questions arise regarding the passing of title under such claims when confirmed or recognized by Congress. In the case of Stein et al *v.* England (80 Southern Reporter, 362) the Supreme Court of Alabama held that until the issuance of a patent the land embraced in a donation claim under section 3 of the act of March 3, 1819 (3 Stat., 528), was exempt from taxation and that title thereto could not be acquired by tax sale or adverse possession. While the court referred to this claim as a private land claim, the grant was in fact a donation to an actual settler from the United States and not a claim derived from a former Government.

The issuance of patents on private land claims continues and the correspondence from claimants, abstracters, and other interested parties requesting information concerning the laws and facts under these claims still forms an important part of the work of this office. Every removal of the records of this office adds to the difficulty of examination of claims or furnishing copies of papers.

CLAIMS IN TEXAS.

On June 12, 1919, the First Assistant Secretary rendered a decision that the United States has no jurisdiction over public lands or private-land claims in Texas, and consequently no duty to perform in connection therewith, and that if surveys, determinations, or adjustments are necessary to define the rights of any parties in interest they must be performed or made by the State of Texas or such tribunals as may have authority from the State to act.

On November 3, 1917, April 26, 1918, and July 10, 1918, the Commissioner of the General Land Office considered various phases of applications and arguments presented by Messrs. B. F. Nysewander and Walter Holland, and held that the Land Department had no jurisdiction over lands in Texas, and the decision by First Assistant Secretary Vogelsang fully answers every argument presented by the applicants.

The courts of Texas have uniformly recognized that the State of Texas was the source of sovereign title in that State, and those decisions have been accepted by the Federal courts.

If the applicants were correct in their contentions, two important corrollaries would have been advanced later. Under the laws of Spain and Mexico all minerals were reserved in grants of land.

The Republic of Texas and the State of Texas succeeded to these mineral rights, but the State has, by legislative enactment, relinquished its right to minerals to the owners of the soil. If the United States acquired these mineral rights from the sovereigns, however, applications to locate the vast petroleum fields in Texas under the United States mineral-land laws would follow.

The second corrollary is that the State statutes of limitations quieting title under adverse possession could not begin to run until the legal title has passed from the United States by patent or otherwise. The applicants admitted that they were not in possession of the land for which patents were sought and argued that they were kept out of possession through the failure of the United States to issue patents.

It is possible that the presentation of this unique proposition to the department is preliminary to a campaign in the courts.

WOOD AND PASTURE RESERVES, OKLAHOMA.

Under the act of June 5, 1906 (34 Stat., 213), the wood and pasture reserves in the former Kiowa, Comanche, Apache, and Wichita Indian Reservations, Okla., were opened to homestead entry under sealed bids, to the highest bidders, the price of the land to be not less than $5 per acre. There was much competition, and the prices bid were high. Awards were made to these bidders of 380,790.69 acres for a total of $4,015,385.25, or an average of $10.50 per acre. The purchasers found themselves unable to meet the payments as they fell due, and numerous extensions of time to make payments were granted by Congress, the last one on August 1, 1914 (38 Stat., 598). This act contained the further provision that "no forfeiture of entry shall be declared except for fraud." It was held that the effect of this legislation was to limit the cause of forfeiture to fraud, and that a contest brought on the ground that the entryman was not complying with the law was insufficient and must fail. It clearly appeared from correspondence that a number of entrymen were not complying with the law, several of them never having established residence on the land.

To remedy this situation the act of March 3, 1919 (40 Stat., 1318), was passed. This act authorized the contesting and cancellation of the entries referred to where a noncompliance with law in the matter of residence, cultivation, and improvement is alleged and proven, and also made provision for giving settlers on the lands for two years prior to the cancellation of the entry a preference right to enter the land. The regulations under this act allowed entrymen six months from the anniversaries of their entries in 1919 (occurring mostly in March and April), within which to submit the regular proof of compliance with the law.

ABANDONED MILITARY RESERVATIONS.

There are a number of abandoned military reservations that will probably be disposed of during the present fiscal year. Most of these reservations are subject to disposal under the act of July 5, 1884 (23 Stat., 103), which provides for the public sale of the lands for cash at not less than the appraised price. The lands in several of the reservations have been surveyed and appraised and will be offered for sale as soon as the regulations governing their disposal can be prepared and approved. Among the lands thus to be disposed of is a reservation comprising nearly 26 acres at Bayside, also known as Point Comfort, in Monmouth County, N. J.; Batton Island, situated near the mouth of St. Johns River, near Jacksonville, Fla.; a reservation comprising 77.80 acres situated on the north side of the entrance to Gig Harbor near the city of Tacoma, Wash., placed under the control of the Interior Department on August 22, 1917; and reservations numbered 23 and 24, comprising 1,239.20 acres, also near Tacoma, Wash., subject to disposal under the act of July 3, 1916 (39 Stat., 342).

Fort Sabine in Cameron Parish, La., is probably the largest reservation to be disposed of. The lands in this reservation have been surveyed with a view to their disposal under the act of July 5, 1884, and the lands are being appraised. Especial interest is attached to this reservation because it is near the Beaumont, Tex., oil fields.

There are also 10 small reservations in Louisiana, comprising 6,172.79 acres which have been surveyed and appraised, but the offering of the lands has been suspended pending proposed legislation granting the lands to the State.

The lands in the Three Forks Owyhee Reservation in Idaho and Oregon have been surveyed and appraised and a report as to the character of the land has recently been received from the United States Geological Survey. These lands will probably be offered for sale during the coming year.

The Fort Grant Reservation in Arizona has been surveyed and appraised and a report as to the character of the lands has also been received from the Geological Survey. This reservation comprises 9,036.41 acres and will probably be offered during the present fiscal year.

Lands withdrawn for a military road in connection with the Fort Bayard Reservation, N. Mex., were appraised with a view to their disposal and public sale under the act of 1884. The department held however, on May 6, 1919, that these lands were not a part of a permanent military reservation within the letter and spirit of said act, and therefore were not subject to disposal under said act. These lands will first be opened to entry under the homestead laws and then to entry under the other public-land laws.

INDIAN ALLOTMENTS.

Trust patents have been issued during the year on 2,433 allotments of a total area of 395,549.95 acres. With the exception of large reservations in New Mexico and Arizona and the mission reservations in California, the great bulk of lands held in common by the several tribes has now been divided among the individual Indians entitled thereto.

The 25-year trust period prescribed by the act of February 8, 1887, has expired in the case of many thousand allotments, but the trust has been extended by the President except in such cases as investigation has shown that, in furtherance of the departmental policy of making the Indians self-sustaining, the patent in fee should issue to the Indian allottee or the purchaser. Three thousand two hundred and seven of said fee patents have been issued during the past year, of a total acreage of 410,529.79 acres. The issuance of the patent in fee to an Indian makes him a citizen of the United States.

In conformity with the regulations approved by the department April 15, 1918, it has been necessary to reject many applications for allotment of public lands heretofore filed by or for married Indian women, no provision having been made for them. As provision is made in the new regulations that an Indian applicant who has not complied with the law as to use of his land should be allowed two years from notice to show such use, notice to that effect has been issued during the past year in many cases. If the notice is not heeded, the applications will ultimately be rejected. Seven hundred and fifty-five applications have been finally rejected and 912 have been accepted during the year.

LOGGING OPERATIONS CEDED CHIPPEWA INDIAN LANDS, MINNESOTA.

Owing to the shortage of labor, unsatisfactory conditions in the lumber market, and the fact that most of the timber has been cut, there was little done during the past year in Chippewa logging operations under the act of June 27, 1902 (32 Stat., 400). Only 1,524,120 feet of timber were cut last year, for which the purchasers paid $9,030.62, as compared with 11,788,200 feet, valued at $85,821.77, cut the previous year. The total amount cut up to July 1, 1919, under said act, is 1,283,025,956 feet, for which the purchasers paid $9,084,839.44.

Three companies that purchased large amounts of timber did not cut any timber during the last year. According to Government estimates, 51,485,300 feet of timber remain to be cut by these three companies. The actual amount of timber remaining to be cut is proba-

bly 25 per cent in excess of the Government estimate. These three companies have requested further extensions of time for three years within which to complete the cutting of the timber. In accordance with the terms of the last extensions of time granted these companies, they have paid interest amounting to $32,029.14 for the period from July 1, 1916, to July 1, 1918, on the value of the timber still standing on said dates.

With an improvement in labor conditions and the lumber market, logging operations will probably increase very much during the present year and the operations will probably be closed within the next three years.

MINNESOTA DRAINAGE.

The process of reclaiming vast areas of swamp lands surrounding the head waters of the Mississippi River in the State of Minnesota has come to be known as "Minnesota drainage." By the provisions of the act of May 20, 1908 (35 Stat., 169), known generally as the Volstead Act, the National Government has permitted the State of Minnesota to make the public lands in that State subject to the State's drainage system. Under this system one or more counties in the State under a legal proceeding lays out a territory to be drained by a proposed ditch or canal, approximates the cost and assesses this cost against all lands benefited, as drainage taxes. The payment of this drainage tax is usually spread over a term of 20 years. These taxes become a lien against all lands, public and private. The collection of these taxes against public lands is initiated by the State selling its tax lien at public auction. These sales are held annually, beginning on the second Monday in May. Purchasers at these annual sales are given certificates of tax-judgment sale. The holders of these certificates are entitled to make an application to purchase not to exceed 160 acres of land under the act of May 20, 1908, by depositing the certificates, the purchase price of the land, and all fees and commissions in the office of the register and receiver of the local land office in the district where the land is located.

By means of laterals a single ditch or canal is made to drain a large area. Along the banks of these canals roads have been laid out and the excavated matter from these canals is said to make an excellent roadbed.

The popularity of this reclamation process is shown by the great number of inquiries that pour into the office from practically every State in the Union. After a territory is drained, the land cleared, the virgin soil broken and sweetened, its fertility, it is claimed, compares favorably with land that sells in the older settlements at from $100

to $150 per acre. No residence, improvements, or cultivation is required in this class of entries, the improvement by way of drainage and paying the consideration price being, presumably, in lieu thereof.

There seems to be nothing in the act of May 20, 1908, to prevent speculators buying up any number of these tax certificates at the annual sales and selling this right to enter the land at as great a profit as possible. There is in the office a letter from an entryman stating that he has been induced by a speculator to purchase 160 acres of land in a drainage district, for $1,250. The entryman discovered that the speculator paid into the local land office as purchase money, fees and commissions, the sum of $222.80. The difference between $1,250 and $222.80 represented the speculator's profit, a clear gain of about 500 per cent. The office receives many complaints along this line. It is true that entrymen could save themselves this financial loss usually by making proper inquiry at the county auditor's office, and at the General Land Office, unless they desire specific tracts covered by outstanding certificates; yet it would seem proper to throw every safeguard possible about those who become purchasers under this act. This protection would be practically provided by an amendment to the Volstead Act specifically limiting the acreage on which tax-lien certificates might be purchased by any person, company, or corporation.

On August 13, 1918, regulations were formulated governing entries by persons who had purchased entered lands at the annual tax sales. The regulations provide for giving notice to the entrymen of the expiration of the period of redemption, as provided by the laws of the State of Minnesota. Upon the filing of a certificate showing that the State requirements have been complied with, the entry is canceled and the purchaser at the tax sale has 90 days within which to pay for the land and make his entry, as provided in the Volstead act.

During the past year legislation has been enacted by Congress validating a number of entries in cases where lands have been assessed for drainage charges and sold prior to the date the land was opened to settlement and entry. Under the act of May 20, 1908, lands in Minnesota were not subject to drainage charges until opened to entry. Assessments thus made were, therefore, illegal, and special legislation was necessary to protect innocent purchasers where the land was subsequently opened.

There have been approved for patenting during the year 1,118 entries subject to drainage taxes under the Volstead act. These mostly were for 160 acres each, or an area of approximately 176,320 acres, as against 146,240 acres the previous year. A total area of 766,920 acres has been patented under said act.

MUD LAKE BOTTOM, MINNESOTA.

The dispute that existed at the close of the last fiscal year between the entrymen and the riparian owners relative to the title to lands in Mud Lake bottom has not yet been determined.

All the data and a full statement of the facts relating to the dispute have been collected by this office and transmitted to the Department of Justice. It is the understanding of this office that legal proceedings will soon be instituted whereby the rights of all parties interested will be determined.

Mud Lake was drained by a canal under the Minnesota drainage laws and the bottom of the lake containing 4,929.64 acres was opened to homestead entry by circular of February 19, 1916, under the act of January 14, 1889 (25 Stat., 642), being ceded Chippewa Indian lands.

The question of title to Mud Lake bottom was submitted to the Attorney General, who rendered an opinion on June 9, 1912 (29 Op. 455), to the effect that the lands should be surveyed and disposed of for the benefit of the Indians, but that warning should be given prospective settlers of the possibility of litigation with patentees of lands surrounding said lake, claiming as riparian owners. The proposed litigation will determine who is entitled to own Mud Lake bottom.

SALE OF FLATHEAD LANDS.

Four thousand three hundred and fifty-six and twenty-four one-hundredths acres of land within the former Flathead Indian Reservation, Mont., situated in the Kalispell (Mont.) land district, were offered for sale at Kalispell, commencing June 20, 1919, and 9,586.05 acres within said former reservation, situated in the Missoula (Mont.) land district, were offered for sale at Missoula, commencing June 26, 1919. The lands were listed in tracts embracing from 40 to 160 acres each. Fourteen of the 48 such tracts in the Kalispell district sold for $2,466.85, and 16 of the 129 such tracts in the Missoula district sold for $2,029.73. The offerings were made under the act of April 23, 1904 (33 Stat., 302). Many of the tracts offered were "culls" from former sales.

SALE OF FORMER SIOUX LANDS.

Twenty-six tracts of land within the former Sioux Indian Reservation, S. Dak., embracing from 40 to 160 acres each, were offered for sale at Pierre, S. Dak., under the act of March 4, 1915 (38 Stat., 1189), and were sold for $4,818.08.

MINING CLAIMS.

During the year, 477 mineral entries, 75 coal entries, 140 contest records, and 208 potash applications were received; 553 mineral entries were approved, 19 canceled; total disposed of, 572; 71 coal entries approved, 13 canceled, total, 84; 146 contests decided and 380 potash applications disposed of; 30 hearings were ordered. 96 appeals transmitted to the department, 67 mineral surveyors' bonds approved. The total area embraced in approved mineral entries for the year was 32,559.774 acres, for which the sum of $137,381.69 was received; in approved coal entries, 7,843.17 acres, for which $295,031.75 was received.

ALASKA COAL LAND LEASES.

A lease of blocks 49 and 50, Bering River field, comprising 2,080 acres, was issued during the year, making a total of 4,500 acres under lease in that field. In the Matanuska field no additional areas have been leased. There are 2,840 acres in this field now under lease. No leases have been made in the Nenana field.

POTASH LEASES AND PERMITS.

During the year the leases awarded of lands in Searles Lake, Calif., were closed, covering a total of 12,760 acres in 9 leases, and another lease for 980 acres of the lake bed has been authorized.

Four applications to lease have been rejected. Permits for camp sites and refining works have been issued to some of the lessees. None of the lessees have produced any potash under their leases, but at least one is erecting a plant. Extensions of time for beginning operations have been granted by the Secretary to the other lessees, predicated on the unsettled condition of the potash market due to the sudden closing of the war. The leucite lands in Sweetwater County, Wyo., have been tied up by litigation in the courts, which just lately ended in favor of the Government, and a lease for 920 acres of the land has been authorized by the Secretary. Another application to lease these lands is on file.

Applications for permits to prospect for potash were received to the number of 208 during the year, making a total of 494 applications received altogether. There were issued 93 permits to prospect, making a total of 102 permits issued. Two of these have been canceled. Two hundred and seventy-eight applications were rejected, the potash situation as to prospective prices and sources of supply being apparently responsible for a large number of the rejections. At this time few applications are being received.

NATIONAL FORESTS.

Since the issuance of my last annual report two national forests have been enlarged and 23 reduced under the act of June 4, 1897 (30 Stat., 34, 36), and 3 have been enlarged under the provisions of the act of March 1, 1911 (36 Stat., 961). Certain of the revested Oregon & California Railroad lands within the exterior limits of the Oregon National Forest, Oreg., aggregating 10,760.73 acres, have been made part of such reservation by the act of October 21, 1918 (40 Stat., 1015), and the Minam Forest, in Oregon, has been enlarged by the act of March 3, 1919 (40 Stat., 1319). Through the creation of the Grand Canyon National Park by the act of February 26, 1919 (40 Stat., 1175), the Kaibab and Tusayan Forests, in Arizona, have been materially reduced. The area which has been added to national forests during the year from the public domain is 39,234 acres, exclusive of the above-mentioned revested railroad lands, and that acquired by the United States under the above-mentioned act of March 1, 1911, amounts to 44,468 acres. Due to recent surveys, recomputations have been necessary of the areas of certain national forests, effecting a decrease of 114,587 acres in the estimated total of last year.

There are now 151 national forests, embracing 174,261,393 acres, of which a little over 88 per cent is public land. The net decrease in national forest area since the beginning of the fiscal year is 1,689,873 acres. During the year, 1,658,988 acres have been excluded from national forests, 609,925 acres thereof reserved or withdrawn for certain public purposes, and the public lands in the remaining 1,049,063 acres and in 166,875 acres released from temporary or other withdrawals for forest purposes have been restored to entry and other disposition. Under the provisions of the act of June 25, 1910 (36 Stat., 847), the public lands in 579,216 acres have been withdrawn for forestry purposes or in aid of forest reservation legislation, the area embraced in withdrawals for such purposes at the close of the fiscal year being 746,568 acres.

During the fiscal year nine administrative sites, embracing 1,292 acres, have been withdrawn by executive orders under the above-mentioned act of June 25, 1910, for use by the Forest Service in the administration of certain national forests, and 352 withdrawals for such purpose have been revoked, covering 39,389 acres. There are now 11 rights of way for wagon roads and 974 administrative sites withdrawn, embracing 220,710 acres, 156 sites, covering 19,960 acres, being near national forests, and 818 sites, embracing 200,750 acres, in national forests.

LIEU SELECTIONS FOR LANDS IN NATIONAL FORESTS.

On July 1, 1918, there were pending of the so-called "Hyde-Benson" selections some 180 cases in which contest proceedings had been instituted on charges of a special agent that title to the base land had been secured by fraudulent means. April 1, 1918, the department in the case of F. A. Hyde & Co. (46 L. D., 341), reversed the previous rulings and held as to lands in California that if patent issued to a real person, the fact that such patent was fraudulently procured was immaterial.

The fact that the State of California took no steps to rescind such patents when it was in a position to do so, and was barred by the statute of limitations at that time, were the moving causes of the decision of April 1, 1918. Under said ruling the office has dismissed the proceeding in 71 cases, and action in 10 cases has been suspended pending further investigation, or for some other good and sufficient reason. There were also pending in the department at the beginning of the fiscal year, 32 cases of the class just mentioned. All were, however, remanded to this office during the year, and the proceedings dismissed.

There were also pending at the beginning of the year 100 cases in which it was charged the patentees of the State of California were fictitious persons. A consolidated hearing as to these cases was held at San Francisco, resulting in 53 cases being returned to the department under remanding orders, 16 being rejected in this office subject to appeal, and 31 awaiting action.

All selections based on lands, the title to which was secured from the State of Oregon have heretofore been suspended to await the result of the suits instituted by the State to cancel the patents issued by it on fraudulent representations. The State was successful in many of its suits, and copies of the decrees cancelling the State patents have recently been received here. This office will as rapidly as possible take up and hold for rejection all selections based on such canceled State patents. As to the remaining suits by the State, the same were dismissed for the reason that the United States was not made a party thereto, but such dismissals were without prejudice to the institution of new and proper proceedings.

Aside from the above, there were 19 selections patented and 50 canceled during the year.

LIEU SELECTIONS FOR LANDS IN INDIAN RESERVATIONS.

The act of April 21, 1904 (33 Stat., 211), authorizes selections of public lands in New Mexico and Arizona in lieu of lands in Indian reservations. About 1,400,000 acres have been selected and patented

under this act. On June 6, 1916, the department decided not to allow any further exchanges under this act, unless in exceptional cases. Two such cases have recently arisen. The first of 47,056.75 acres in the Laguna Pueblo Reserve, owned by the Santa Fe Pacific Railroad and the New Mexico & Oregon Land Co., and the second of 37,243.63 acres of Zuni lands, of the Santa Fe Pacific Railroad Co. Since said order of June 6, 1916, was given, exchanges aggregating 504,993.11 acres have been authorized, and selections in lieu thereof to the extent of 258,941.08 acres are pending.

During the past year, there were patented 17 selections made under said act.

CONTESTS.

Under the jurisdiction vested in the Commissioner of the General Land Office, not only by the statutes, but by their interpretation in the courts, the duties of the Commissioner in determining what the provisions of the law may be and how to apply the facts in any specific case involving a claim to public lands, are second to none of any court in the land. It is true that it is only the decisions of the Land Department upon questions of fact that are final. Mistakes of law made by the executive may be corrected in the courts, but the ascertainment of facts in any specific case can not be so reviewed. Again, while the courts are open for the correction of mistakes of law made by the Land Department, such mistakes are not reviewable until after the jurisdiction of the Land Department has been fully exercised by the issuance of patent. So long as the land remains within the jurisdiction of the department, the courts will not interfere with the exercise of that power. Hence, it is that we are confronted with the gravest responsibilities in the solution of the legal problems that are presented in the administration of our public-land laws.

Miners, homesteaders, timber claimants, contend for the same land under different laws; State and railroad grants are found in conflict; State grants conflict with each other; under any of these laws we are likely to be confronted by efforts to secure lands that are not subject to disposition under the particular law through which the claim is asserted. In all this class of cases, however, the adjudication of rights is incidental to the adjustment of grants and the allowance of claims under specific statutes.

But, aside from the foregoing, due provision has been made by statutes under which conflicting claims for the same tract of land can be presented for adjudication before the General Land Office, and this in itself is a fruitful source of litigation. And again, special statutory inducement is offered to those who seek to secure a prefer-

ence right on their own account through contesting other claims for failure to comply with the law. These lines of litigation before the Land Department, ordinarily known as contests, constitute one of the important activities of our service.

The contest work, as such, is now well in hand, the office having disposed of, during the past fiscal year, 10,017 litigated cases. Many contests do not proceed to hearing, but abate or are dismissed for failure of prosecution by the contestant; and many entries are canceled under the Rules of Practice for default of the entryman in not serving and filing answer to contest charges. During the past year 1,654 contests were disposed of in one or the other of these two ways, and the work is now current.

RESTRICTED OFFICE QUARTERS.

The legislative, executive, and judicial appropriation act, approved March 1, 1919, and providing appropriations for the fiscal year 1920, provided also for the appointment of a joint committee of the Senate and House of Representatives who were given authority to make such disposition of space available for the personnel of the various Government activities in Washington, whether the same were in Government-owned or leased buildings, as they deemed equitable. The joint committee was designated the Public Buildings Commission, and by order of this commission the General Land Office has been required to surrender over 24,000 square feet of space occupied by employees for the use of the employees of the Bureau of Internal Revenue of the Treasury Department. The other bureaus in the new Interior Department Building, including the office of the Secretary, also have surrendered much space, the total aggregating 85,000 square feet.

The discouraging features of this surrender of space are that practically no discrimination between employees was allowed, but a maximum of 75 square feet per employee was fixed as a basis for the retention of space by the bureau, no matter whether the employees were doing technical, scientific, or expert legal work, at salaries varying between $1,800 and $4,500 per annum, or were performing simple copying or card writing, at compensations varying between $720 and $1,000 per annum. The employees of the former groups, with their necessary equipment for intelligent work, require very much more space than those of the latter, but the minimum of 75 square feet per person, authorized by the health department, is fixed for all. The result is awaited with anxiety, because it appears certain that a material loss in efficiency and possibly of high-grade personnel will follow the crowding process.

This bureau has surrendered a total of 65 rooms, averaging 370 square feet to a room, but a great many of the rooms retained are the ordinary unit room of 280 square feet, into which we have been compelled to place four employees, with their desks, chairs, bookcases, wardrobes, and working files. The average space for each such employee and his working equipment is 70 square feet. The appearance of some of these rooms suggests the propriety of a change in health office space regulations.

This consolidation of the clerical space in the General Land Office has revived memories of the not distant past when a crowded and insanitary working condition was the rule in the old building. Two years ago, following more than two years of planning and construction, we moved into the new building, carefully designed to meet not only our own special needs, but the requirements of the inter-related activities of the several bureaus here happily housed. Unhappily, that efficient arrangement of personnel and equipment has now been seriously impaired.

LEAVE OF ABSENCE ON ACCOUNT OF DROUGHT.

Due to the prevalence in some of the northwestern public land States of severe drought conditions during the last two seasons as well as the present, Congress, in the Agricultural appropriation act of July 24, 1919, Public No. 22, authorized homestead settlers or entrymen who, during the calendar year 1919, find it necessary to seek employment in order to obtain food and other necessaries of life because of great and serious drought conditions, to absent themselves from their claims for such purpose during all or part of the calendar year, or the current year of such homestead which may fall principally in 1919; and further, that in making final proof the absence so granted shall be counted and construed as constructive residence by the homesteader.

Promptly upon the passage of this act, telegraphic instructions were issued by the General Land Office to all of the district land offices where drought conditions were believed to exist, announcing the provisions of the act, with instructions as to their action thereunder. Immediately thereafter, formal instructions of July 29, 1919 (Circular No. 652), were issued with the approval of the department, giving more specific instructions as to the administration of the act.

An unusual feature of this relief act to be noticed is that the period of absence authorized is to be construed as a portion of the period of residence required under the homestead law in order to earn title.

WAR RELIEF LEGISLATION.

In my last annual report I called attention to the several acts that had been passed by Congress, due to the war with Germany, lessening the requirements essential to the acquisition of title to public lands, especially in the matter of residence on homestead claims, or the performance of assessment work on mining claims.

At that time the acts noted were: July 28, 1917 (40 Stat., 248), for the relief of homestead settlers, applicants, and entrymen; public resolution No. 10, approved July 17, 1917 (40 Stat., 243), to relieve the owners of mining claims from performing assessment work; the act of August 7, 1917 (40 Stat., 250), for the protection of desert-land claimants; the act of August 10, 1917, section 11 (40 Stat., 273), authorizing the Secretary of the Interior to suspend certain provisions of residence under the reclamation laws during the existing war; the act of October 5, 1917 (40 Stat., 343), relieving mining claimants from performance of annual assessment work during years 1917 and 1918; the act of October 6, 1917 (40 Stat., 391), authorizing the execution by any soldier who had prior thereto acquired any interest in the public lands of affidavits before his commanding officer; the act of December 20, 1917 (40 Stat., 430), authorizing the absence, for the purpose of engaging in farm labor, of any homestead settler or entryman whose claim was initiated prior thereto; the act of March 8, 1918 (40 Stat., 448), known as the "soldiers' and sailors' relief act," affording general protection to the civil rights of persons in the military service.

Additional legislation to the same end has been provided in the following cases:

The act of August 31, 1918, section 8 (40 Stat., 957), providing that any person under the age of 21 years who has served or shall hereafter serve in the Army of the United States during the present emergency, shall be entitled to the same rights under the homestead and other land and mineral entry laws, general or special, as those over 21 years of age now possess under said laws. This provision of the statute was promulgated, with suitable instructions, in Circular No. 662. The act of February 25, 1919 (40 Stat., 1161), extending the provisions of the homestead laws in the matter of credit for the period of enlistment to the soldiers, nurses, and officers of the Army, and seamen, marines, nurses, and officers of the Navy and Marine Corps of the United States, who have served or will have served with the Mexican border operations, or during the war between the United States and Germany and her allies. Instructions under the provisions of this act were promptly issued, and may be found in Circular No. 641.

In each of these acts the relief measure is limited by some phrase calculated to express the period in which the measure shall be applicable, and beyond which it shall not be extended, and I deem it appropriate to call attention to the several phrases of limitation at the present time, not because it would seem that in any instance has the period of limitation yet expired, but rather to assemble these several provisions in convenient form for future reference, and that no one of them may be overlooked when the time arrives for proper action with respect thereto. The limitations noted are as follows:

(1) Act of July 28, 1917 (40 Stat., 248), "During any war in which the United States may be engaged."

(2) Act of July 17, 1917 (40 Stat., 243), "During the present war with Germany."

(3) Act of August 7, 1917 (40 Stat., 250), "During the present war with Germany and six months thereafter."

(4) Act of August 10, 1917 (40 Stat., 273), "The national emergency resulting from the existing state of war."

(5) Act of October 5, 1917 (40 Stat., 343), "The present war with Germany."

(6) Act of October 6, 1917 (40 Stat., 391), "During the continuance of the existing war with Germany."

(7) Act of December 20, 1917 (40 Stat., 430), "During the pendency of the existing war with Germany."

(8) Act of March 8, 1918 (40 Stat., 448), "The war in which the United States is at present engaged."

(9) Act of August 31, 1919 (40 Stat., 957), "During the present emergency."

(10) Act of February 25, 1919 (40 Stat., 1161), "During the war with Germany and its allies."

REPAYMENTS.

The existing laws governing repayments, section 2362, United States Revised Statutes, act of June 16, 1880 (21 Stat., 287), and the act of March 26, 1908 (35 Stat., 48), provide for the return of moneys covered into the Treasury of the United States received in connection with the disposal of the public lands, to be repaid to the entryman, his heirs or assigns, or his legal representatives, in the absence of fraud on their part, in all cases where lands have been erroneously sold; where money has been paid by innocent parties on fraudulent and void soldiers' and sailors' additional homestead entries; where entries were canceled for conflict; where entries are erroneously allowed and can not be confirmed; where applications to make entry, filing, selection, etc., are rejected; and where any amount has been paid in excess of the legal requirement.

Under said laws there were stated during the last fiscal year 762 accounts, allowing repayment of $80,896.70, and during said period there were denied 285 claims for repayment. This number of claims allowed and the amount repaid include 91 accounts allowing repayment of $17,601, received in connection with sale of various Indian reservation lands and repaid from Indian trust funds.

Repayment claims, allowed and denied by years.

Year.	Claims allowed.	Amount.	Claims denied.
1911	2,338	$178,437.02	712
1912	2,097	178,952.15	619
1913	2,427	217,614.09	644
1914	1,775	123,139.11	482
1915	1,689	305,310.83	709
1916	1,700	218,971.46	940
1917	1,215	106,888.42	834
1918	1,241	99,370.04	495
1919	762	80,896.70	285

PROPOSED LEGISLATION.

For the reasons set forth herein, and in conformity with my recommendations in the annual report for 1918, I again suggest new legislation as follows:

1. Fixing a period beyond which selections under the swamp-land grant will not be received.

2. Authorizing issue of patent, with mineral reservations, to purchaser in good faith from the State of designated school sections subsequently found to have been excepted from the grant to the State on account of the mineral therein.

3. Forfeiting rights of way for failure to construct within the statutory period.

4. Repeal of the provisions of law, applicable to Alaska, creating reserved shore spaces between entries along navigable waters, and limiting the water frontage of such entries.

5. Authorizing State transferees, under swamp-land grant, to purchase, under certain conditions, the land from the United States where the State sold without title.

CONCLUSION.

Considering the volume and character of the work transacted in this office during the year that is now closed, with all of its peculiar handicaps to progress, I find much reason to look with pride upon what we have accomplished. To a great extent, the office is laboring under the same difficulties noted in my last annual report, due directly to the result of war conditions and our consequent inability to pro-

cure or retain experienced employees in our service. The removal of restrictions on transfers since the armistice, on one hand, and the low entrance salaries for employees competent to do our work, on the other, worked a constant depletion of our forces. In the latter respect, however, some relief was provided in the last legislative, executive, and judicial appropriation bill, by which all of the $720 and a number of the $900 and $1,000 places were eliminated and a less number of $1,200 places substituted therefor, not, however, increasing the aggregate appropriation.

In the field-service work of investigation we are just a little better off than we were one year ago. We have made fair progress in closing up the oil-land cases in California, but we still have that great controversy with us, both in the courts and in land-office hearings, with the outlook as to legislation which may tend to adjust the matter yet uncertain. In the field-surveying work we are in fairly good shape, though over 40 per cent of our engineers, surveyors, and transitmen, and over 600 of our field assistants left the service during the period of the war. Likewise, the offices of surveyors general as a whole are probably better up with their work than ever before. The work in most of the local offices is generally in good condition. Too much praise can not be given to the membership of the land service for its loyal support during the trying year that is now past. With all of the calls for the countless sacrifices incident to the great war, our people have, without fail, made good in our time of need.

In the readjustment of salaries contemplated by the present classification movement, I trust it will be remembered that the provisions made for the operation and maintenance of the land department are entirely out of keeping with those made for the equipment of later activities in the Government service.

CLAY TALLMAN,
Commissioner.

The SECRETARY OF THE INTERIOR.

STATISTICS RELATING TO THE DISPOSITION OF THE PUBLIC DOMAIN.

Area of States and Territories.

[Based upon careful joint calculations made in the General Land Office, the Geological Survey, and the Bureau of the Census.]

State or Territory.	Land surface.		Water surface.		Total areas.	
	Sq. m.	*Acres.*	*Sq.m.*	*Acres.*	*Sq. m.*	*Acres.*
Alabama	51,279	32,818,560	719	460,160	51,998	33,278,720
Arizona	113,810	72,838,400	146	93,440	113,956	72,931,840
Arkansas	52,525	33,616,000	810	518,400	53,335	34,134,400
California	155,652	99,617,280	2,645	1,692,800	158,297	101,310,080
Colorado	103,658	66,341,120	290	185,600	103,948	66,526,720
Connecticut	4,820	3,084,800	145	92,800	4,965	3,177,600
Delaware	1,965	1,257,600	405	259,200	2,370	1,516,800
District of Columbia	60	38,400	10	6,400	70	44,800
Florida	54,861	35,111,040	3,805	2,435,200	58,666	37,546,240
Georgia	58,725	37,584,000	540	345,600	59,265	37,929,600
Idaho	83,354	53,346,560	534	341,760	83,888	53,688,320
Illinois	56,043	35,867,520	622	398,080	56,665	36,265,600
Indiana	36,045	23,068,800	309	197,760	36,354	23,266,560
Iowa	55,586	35,575,040	561	359,040	56,147	35,934,080
Kansas	81,774	52,335,360	384	245,760	82,158	52,581,120
Kentucky	40,181	25,715,840	417	266,880	40,598	25,982,720
Louisiana	45,409	29,061,760	3,097	1,982,080	48,506	31,043,840
Maine	29,895	19,132,800	3,145	2,012,800	33,040	21,145,600
Maryland	9,941	6,362,240	2,386	1,527,040	12,327	7,889,280
Massachusetts	8,039	5,144,960	227	145,280	8,266	5,290,240
Michigan	57,480	36,787,200	500	320,000	57,980	37,107,200
Minnesota	80,858	51,749,120	3,824	2,447,360	84,682	54,196,480
Mississippi	46,362	29,671,680	503	321,920	46,865	29,993,600
Missouri	68,727	43,985,280	693	443,520	69,420	44,428,800
Montana	146,201	93,568,640	796	509,440	146,997	94,078,080
Nebraska	76,808	49,157,120	712	455,680	77,520	49,612,800
Nevada	109,821	70,285,440	869	556,160	110,690	70,841,600
New Hampshire	9,031	5,779,840	310	198,400	9,341	5,978,240
New Jersey	7,514	4,808,960	710	454,400	8,224	5,263,360
New Mexico	122,503	78,401,920	131	83,840	122,634	78,485,760
New York	47,654	30,498,560	1,550	992,000	49,204	31,490,560
North Carolina	48,740	31,193,600	3,686	2,359,040	52,426	33,552,640
North Dakota	70,183	44,917,120	654	418,560	70,837	45,335,680
Ohio	40,740	26,073,600	300	192,000	41,040	26,265,600
Oklahoma	69,414	44,424,960	643	411,520	70,057	44,836,480
Oregon	95,607	61,188,480	1,092	698,880	96,699	61,887,360
Pennsylvania	44,832	28,692,480	294	188,160	45,126	28,880,640
Rhode Island	1,067	682,880	181	115,840	1,248	798,720
South Carolina	30,495	19,516,800	494	316,160	30,989	19,832,960
South Dakota	76,868	49,195,520	747	478,080	77,615	49,673,600
Tennessee	41,687	26,679,680	335	214,400	42,022	26,894,080
Texas	262,398	167,934,720	3,498	2,238,720	265,896	170,173,440
Utah	82,184	52,597,760	2,806	1,795,840	84,990	54,393,600
Vermont	9,124	5,839,360	440	281,600	9,564	6,120,960
Virginia	40,262	25,767,680	2,365	1,513,600	42,627	27,281,280
Washington	66,836	42,775,040	2,291	1,466,240	69,127	44,241,280
West Virginia	24,022	15,374,080	148	94,720	24,170	15,468,800
Wisconsin	55,256	35,363,840	810	518,400	56,066	35,882,240
Wyoming	97,594	62,460,160	320	204,800	97,914	62,664,960
	2,973,890	1,903,289,600	52,899	33,855,360	3,026,789	1,937,144,960
Alaska					590,884	378,165,760
Guam					210	134,400
Hawaii					6,449	4,127,360
Canal Zone					442	282,880
Philippine Islands					115,026	73,616,640
Porto Rico					3,435	2,198,400
American Samoa					77	49,280
Virgin Islands					138	88,320
Total					3,743,450	2,395,803,000

Owing to their location adjoining the Great Lakes, the States enumerated below contain approximately an additional number of square miles as follows: Illinois, 1,674 square miles of Lake Michigan; Indiana, 230 square miles of Lake Michigan; Michigan, 16,653 square miles of Lake Superior, 12,922 square miles of Lake Michigan, 9,925 square miles of Lake Huron, and 460 square miles of Lakes St. Clair and Erie; Minnesota, 2,514 square miles of Lake Superior; New York, 3,140 square miles of Lakes Ontario and Erie; Ohio, 3,443 square miles of Lake Erie; Pennsylvania, 891 square miles of Lake Erie; Wisconsin, 2,378 square miles of Lake Superior and 7,500 square miles of Lake Michigan.

In addition to the water areas noted above, California claims jurisdiction over all Pacific waters lying within 3 English miles of her coast; Oregon claims jurisdiction over a similar strip of the Pacific Ocean 1 marine league in width between latitude 42° north and the mouth of the Columbia River, and Texas claims jurisdiction over a strip of Gulf water 3 leagues in width adjacent to her coast and between the Rio Grande and the Sabine Rivers.

United States district land offices, 95.

Locations.	Established.	Opened.
Alabama:		
Montgomery	July 10, 1832	Jan. 1, 1834
Alaska:		
Fairbanks	May 14, 1907	July 1, 1907
Juneau	Apr. 2, 1902	June 20, 1902
Nome	May 14, 1907	July 1, 1907
Arizona:		
Phoenix	July 25, 1905	Oct. 2, 1905
Arkansas:		
Camden	Jan. 16, 1871	Mar. 20, 1871
Harrison	July 14, 1870	Feb. 27, 1871
Little Rock	Feb. 17, 1818	Sept. 1, 1821
California:		
El Centro	June 15, 1916	Sept. 1, 1916
Eureka	Mar. 29, 1858	July 24, 1858
Independence	Apr. 22, 1886	Mar. 22, 1887
Los Angeles	June 12, 1869	Sept. 22, 1869
Sacramento[1]	July 26, 1866	Nov. 12, 1867
San Francisco	Mar. 4, 1911	May 1, 1911
Susanville	Feb. 10, 1871	Mar. 2, 1871
Visalia	Mar. 29, 1858	July 10, 1858
Colorado:		
Del Norte	June 20, 1874	Mar. 22, 1875
Denver	June 4, 1864	Aug. 15, 1864
Durango	Apr. 20, 1882	Oct. 2, 1882
Glenwood Springs	July 3, 1884	Nov. 10, 1884
Hugo	Feb. 6, 1890	Sept. 7, 1890
Lamar	Aug. 4, 1886	Jan. 3, 1887
Leadville	Apr. 5, 1879	July 1, 1879
Montrose	Jan. 4, 1888	Sept. 1, 1888
Pueblo	May 27, 1870	Jan. 16, 1871
Sterling	Feb. 6, 1890	Aug. 1, 1890
Florida:		
Gainesville	June 8, 1872	Apr. 30, 1873
Idaho:		
Blackfoot	Sept. 3, 1886	Nov. 16, 1886
Boise	July 26, 1866	Jan. 13, 1868
Coeur d'Alene	July 14, 1884	Dec. 21, 1885
Hailey	Jan. 24, 1883	July 16, 1883
Lewiston	July 26, 1866	Sept. 26, 1871
Kansas:		
Dodge City	Dec. 20, 1893	Feb. 3, 1894
Topeka	July 24, 1861	Sept. 10, 1861
Louisiana:		
Baton Rouge	Jan. 6, 1911	Apr. 1, 1911
Michigan:		
Marquette	Mar. 19, 1857	July 14, 1857
Minnesota:		
Cass Lake	Apr. 1, 1903	July 1, 1903
Crookston	Apr. 29, 1878	May 5, 1879
Duluth	Mar. 27, 1862	Jan. 15, 1863
Mississippi:		
Jackson	June 23, 1836	July 25, 1836
Missouri:		
Springfield	June 28, 1834	Oct. 4, 1838
Montana:		
Billings	Feb. 5, 1906	July 2, 1906
Bozeman	June 20, 1874	Oct. 5, 1874
Glasgow	Feb. 25, 1907	June 1, 1907
Great Falls	May 8, 1902	Aug. 1, 1902
Havre	Mar. 15, 1910	July 1, 1910
Montana—Contd.		
Helena	Mar. 2, 1867	Apr. 27, 1867
Kalispell	Mar. 2, 1897	July 1, 1897
Lewistown	Apr. 1, 1890	Nov. 26, 1890
Miles City	Apr. 30, 1880	Oct. 19, 1880
Missoula	Apr. 1, 1890	Apr. 20, 1891
Nebraska:		
Alliance	Apr. 16, 1890	July 1, 1890
Broken Bow	....do....	July 7, 1890
Lincoln	July 7, 1868	Sept. 7, 1868
Nevada:		
Carson City	July 2, 1862	Mar. 1, 1864
Elko	Oct. 3, 1913	Jan. 1, 1914
New Mexico:		
Clayton	Dec. 18, 1888	Aug. 12, 1889
Fort Sumner	June 22, 1910	Oct. 1, 1910
Las Cruces	Mar. 10, 1883	May 1, 1883
Roswell	Mar. 1, 1889	Dec. 9, 1889
Santa Fe	May 24, 1858	Nov. 24, 1858
Tucumcari	Mar. 16, 1908	July 1, 1908
North Dakota:		
Bismarck	Apr. 24, 1874	Oct. 12, 1874
Dickinson	Mar. 16, 1904	July 1, 1904
Minot	Sept. 26, 1890	Oct. 1, 1891
Williston	Apr. 26, 1906	Aug. 1, 1906
Oklahoma:		
Guthrie	Mar. 3, 1889	Apr. 22, 1889
Oregon:		
Burns	June 1, 1889	Sept. 2, 1889
La Grande	July 3, 1866	Nov. 15, 1867
Lakeview	June 6, 1877	Aug. 6, 1877
Portland	Aug. 24, 1854	Jan. 1, 1855
Roseburg	Sept. 15, 1859	Jan. 3, 1860
The Dalles	Jan. 11, 1875	June 1, 1875
Vale	Mar. 15, 1910	July 1, 1910
South Dakota:		
Belleiourche	Feb. 6, 1909	July 1, 1909
Gregory	July 14, 1880	Jan. 3, 1882
Lemmon	May 29, 1908	Aug. 1, 1908
Pierre	Feb. 10, 1890	May 12, 1890
Rapid City	Dec. 13, 1888	Jan. 15, 1889
Timber Lake	Feb. 12, 1911	May 1, 1911
Utah:		
Salt Lake City	July 16, 1868	Nov. 1, 1868
Vernal	May 9, 1905	July 1, 1905
Washington:		
Seattle	June 27, 1887	Dec. 3, 1887
Spokane	June 23, 1883	Oct. 1, 1883
Vancouver	May 16, 1860	July 3, 1861
Walla Walla	Mar. 3, 1871	July 17, 1871
Waterville	May 16, 1890	Nov. 6, 1890
Yakima[2]	Apr. 11, 1885	Apr. 24, 1885
Wisconsin:		
Wausau	June 19, 1872	Aug. 19, 1872
Wyoming:		
Buffalo	Mar. 3, 1887	May 1, 1888
Cheyenne	Feb. 5, 1870	Aug. 10, 1870
Douglas	Apr. 23, 1890	Nov. 1, 1890
Evanston	Aug. 9, 1876	Aug. 13, 1877
Lander	Apr. 23, 1890	Nov. 8, 1890
Sundance	Apr. 3, 1890	Oct. 27, 1890

[1] Office originally established Jan. 16, 1857, and transferred to Oakland, Calif., following the fire on Apr. 16, 1906.

[2] Name changed Jan. 1, 1918.

NOTE.—The land offices in Ohio, Indiana, Illinois, and Iowa are abolished, and the vacant tracts of public lands in those States are subject to entry and location at the General Land Office, Washington, D.C.

List of offices of United States surveyors general.

Locations.	Established.
Alaska: Juneau	May 17, 1884
Arizona: Phoenix	Feb. 24, 1863
California: San Francisco	Mar. 3, 1851
Colorado: Denver	Feb. 28, 1861
Idaho: Boise	June 29, 1866
Montana: Helena	July 2, 1864
Nevada: Reno	July 4, 1866
New Mexico: Sant Fe	Mar. 2, 1867
Oregon: Portland	July 17, 1854
South Dakota: Huron	Apr. 10, 1890
Utah: Salt Lake City	July 16, 1868
Washington: Olympia	July 17, 1854
Wyoming: Cheyenne	Feb. 5, 1870

Field division headquarters of special agents of General Land Office.

Field division:	
Portland	Portland, Oreg.
San Francisco	San Francisco, Calif.
Alaskan	Juneau, Alaska.
Helena	Helena, Mont.
Denver	Denver, Colo.
Cheyenne	Cheyenne, Wyo.
Southern	Jackson, Miss.
Salt Lake City	Salt Lake City, Utah.
Santa Fe	Santa Fe, N. Mex.

Present organization General Land Office.

A. Administrative duties. Appointments; bonds of officials, except mineral surveyors; correspondence concerning local officers, surveyors general, etc.; establishment of new land districts, changes in location of district land offices, changes in district boundary lines, discontinuance of local land offices; publication of notices of intention to offer final proof; opening and sale of Indian reservations; printing and binding; bird reservations; leaves of absences; requisitions for supplies; record of attorneys and agents admitted before department and its bureaus, also before district land offices.

B. Record of patents; use of rectigraph and photostat machines in making photographic copies of papers.

C. Homesteads, all original, except reclamation; final homesteads; commuted homesteads; homestead declaratory statements; timber and stone entries; public sales, isolated tracts; private sale, lands in Missouri.

D. Mails and files.

E. Surveys.

F. Reclamation work, excepting Minnesota drainage; rights of way; power sites; withdrawals and restorations under the act of June 25, 1910; desert land entries; easements and permits.

G. Land grants to States and corporations.

H. Contests.

K. Indian allotments and Indian homesteads; opening and sale of Indian reservations; preemptions; townsites; military bounty land warrants; abandoned military reservations; agricultural college and other similar scrip; lieu selections; Indian exchange selections; graduation and credit system entries; private land claims; Minnesota drainage entries; Chippewa logging, Minnesota.

L. Drafting; compilation, engraving, and supervision of publication of United States map for Congress, compilation and revision of State maps, diagrams and miscellaneous maps; custodian of original plats, field notes, and photolithographic copies of township plats.

M. Accounts; repayments; statistics.

N. Mineral entries; contests involving character of land; protests in mineral cases; coal, oil, phosphate, and potash withdrawals and restorations; Northern Pacific classification; mineral segregation plats; bonds of mineral surveyors.

O. Posting, tract books.

FS. Soldiers' additional homesteads; fraudulent entries; timber trespass; unlawful inclosure public domain; suits to set aside patents; disbarment of attorneys and agents; forest reserve eliminations, restorations, etc.

Average number of employees of the General Land Office, June 30, 1919.

In General Land Office, Washington, D. C.	507
In 13 offices of surveyors general	119
In 98 district land offices	226
In the field service	149
In the surveying service	129
In logging service	3
Custodians	1
Total	1,134

Final homestead entries from passage of homestead act to June 30, 1919.

Fiscal year ended June 30—	Number.	Acres.	Fiscal year ended June 30—	Number.	Acres.
1868	2,772	355,086.04	1895	20,922	2,980,809.30
1869	3,965	504,301.97	1896	20,099	2,790,242.55
1870	4,041	519,727.84	1897	20,115	2,778,404.20
1871	5,087	629,162.25	1898	22,281	3,095,017.75
1872	5,917	707,409.83	1899	22,812	3,134,140.44
1873	10,311	1,224,890.93	1900	25,286	3,477,842.71
1874	14,129	1,585,781.56	1901	37,568	5,241,120.76
1875	18,293	2,068,537.74	1902	31,627	4,342,747.70
1876	22,530	2,590,552.81	1903	26,373	3,576,964.14
1877	19,900	2,407,828.19	1904	23,932	3,232,716.75
1878	22,460	2,662,980.82	1905	24,621	3,419,387.15
1879	17,391	2,070,842.39	1906	25,546	3,526,748.58
1880	15,441	1,938,234.89	1907	26,485	3,740,567.71
1881	15,077	1,928,204.76	1908	29,636	4,242,710.59
1882	17,174	2,219,453.80	1909	25,510	3,699,466.79
1883	18,998	2,504,414.51	1910	23,253	3,795,862.89
1884	21,843	2,945,574.72	1911	25,908	4,620,197.12
1885	22,066	3,032,679.11	1912	24,326	4,306,068.52
1886	19,356	2,663,531.83	1913	53,252	10,009,285.16
1887	19,866	2,749,037.48	1914	48,724	9,291,121.46
1888	22,413	3,175,400.64	1915	37,343	7,180,981.62
1889	25,549	3,681,708.80	1916	37,958	7,278,280.60
1890	28,080	4,060,592.77	1917	43,727	8,497,389.68
1891	27,686	3,954,587.77	1918	41,319	8,236,438.18
1892	22,822	3,259,897.07	1919	32,623	6,524,759.68
1893	24,204	3,477,231.63			
1894	20,544	2,929,947.41	Total	1,219,161	184,866,871.59

Timber and stone entries from passage of act, June 3, 1878, to June 30, 1919.

State.	Entries.	Acres.	Amount.
Alabama	408	30,030.77	$87,952.33
Arizona	25	2,862.80	9,071.07
Arkansas	2,270	302,096.38	625,554.86
California	20,514	2,846,285.98	7,244,092.21
Colorado	3,086	379,842.84	980,661.57
Florida	916	1,103,504.65	288,008.67
Idaho	7,460	999,754.27	2,602,726.61
Iowa	3	119.36	298.40
Louisiana	1,583	140,673.25	352,764.51
Michigan	1,749	142,470.89	366,204.61
Minnesota	12,444	1,395,025.81	3,513,690.22
Mississippi	172	11,430.33	35,353.91
Montana	5,114	655,574.08	1,697,681.16
Nebraska	2	97.33	268.00
Nevada	52	6,502.14	16,205.74
North Dakota	81	8,646.31	22,005.78
Oklahoma	1	40.00	100.00
Oregon	26,471	3,759,577.37	9,553,583.92
South Dakota	570	62,167.76	159,881.23
Utah	29	3,004.66	7,388.92
Washington	16,218	2,150,079.96	5,459,883.41
Wisconsin	1,091	79,059.34	198,801.40
Wyoming	3,509	397,781.41	985,155.35
Total	103,768	13,476,627.69	34,207,333.88

Desert-land entries from passage of act, Mar. 3, 1877, to June 30, 1919.

State or Territory.	Entries.		Acres.		Amount.		
	Original.	Final.	Original.	Final.	Original.	Final.	Total.
Arizona	9,012	1,286	2,410,848.20	312,462.69	$605,217.87	$344,077.72	$949,295.59
California	22,887	4,533	5,015,463.48	822,645.63	1,279,019.44	844,982.64	2,115,002.08
Colorado	17,211	3,701	3,187,679.07	651,519.45	897,456.05	645,181.77	1,542,637.82
Dakota Territory	35	1	20,021.00	300.00	5,005.25	300.00	5,305.25
Idaho	17,612	4,637	3,000,110.74	925,636.73	751,445.58	878,051.65	1,629,497.23
Montana	31,819	14,226	5,944,759.40	2,679,756.93	1,492,784.87	2,675,321.84	4,168,106.71
Nevada	2,542	590	555,627.37	117,282.06	129,256.06	116,929.15	246,185.21
New Mexico	11,178	1,549	2,148,224.25	225,682.83	539,195.53	324,153.11	863,348.64
North Dakota	517	114	85,278.51	19,591.75	21,321.09	19,616.49	40,937.58
Oregon	6,457	1,738	1,091,354.67	278,194.00	272,416.39	274,517.78	546,934.17
South Dakota	4,067	609	608,810.58	101,361.12	151,797.37	99,048.85	250,846.22
Utah	7,908	2,539	1,375,833.79	399,130.40	350,798.55	404,611.16	755,409.71
Washington	6,041	646	994,436.99	68,581.71	259,528.65	80,857.67	340,386.32
Wyoming	16,706	6,801	5,457,416.57	1,429,281.30	921,258.30	1,433,391.61	2,354,649.91
Total	153,992	42,970	31,895,864.62	8,031,426.60	7,667,501.00	8,141,041.44	15,808,542.44

Coal-land entries from passage of act, Mar. 3, 1873, to June 30, 1919.

State or Territory.	Entries.	Acres.	Amount.
Alabama	2	239.40	$2,394.00
Alaska	163	37,746.27	377,498.75
Arizona	43	6,693.35	74,997.00
California	38	5,535.06	81,531.30
Colorado	1,049	157,581.02	2,352,815.00
Colorado[1]	447	58,495.65	891,219.55
Dakota Territory	8	583.57	5,835.70
Idaho	13	3,117.41	33,631.80
Montana	484	63,404.02	1,193,327.99
Nevada	8	840.11	11,602.20
New Mexico	224	26,444.67	434,153.05
North Dakota	154	9,063.59	141,280.20
Oregon	67	10,251.03	120,134.30
South Dakota	55	3,583.64	38,964.80
Utah	481	71,173.56	2,007,911.00
Washington	396	63,704.30	1,020,741.00
Wyoming	783	111,423.65	2,725,427.46
Made at General Land Office	1	7.95	159.00
Total	4,416	629,888.25	11,513,624.10

[1] Within the Ute Indian Reservation.

Timber-culture entries from the passage of the act of Mar. 3, 1873, to June 30, 1919.

State or Territory.	Entries.			Area.			Amount.			
	Original.	Final.	Commuted.	Original.	Final.	Commuted.	Fees (original).	Fees (final).	Purchase money.	Total.
				Acres.	*Acres.*	*Acres.*				
Arizona	1,152	52	74	164,806.63	7,149.14	10,223.14	$15,224.00	$208.00	$12,779.26	$28,211.26
Arkansas	41	4	1	4,817.14	480.00	40.00	489.00	16.00	44.00	549.00
California	8,264	481	568	1,163,922.03	63,571.58	78,848.76	110,014.00	1,910.00	98,649.13	210,573.13
Colorado	27,864	3,789	660	4,332,922.19	585,243.30	98,179.52	384,968.00	15,154.00	122,722.36	522,844.36
Dakota Territory	77,146	1,309	.....	12,055,642.98	185,467.24	.....	1,071,862.44	4,984.79	.....	1,079,847.23
Florida	3	.....	.....	480.00	.....	.....	42.00	.....	.....	42.00
Idaho	4,054	341	236	533,957.49	40,436.02	28,244.54	51,447.38	1,369.50	35,305.93	88,122.81
Iowa	1,044	390	40	81,378.95	31,987.87	2,330.89	11,838.83	1,560.00	3,013.62	16,364.05
Kansas	64,315	12,886	964	9,702,653.36	2,005,831.35	142,951.88	883,275.56	51,529.03	178,650.55	1,113,455.14
Louisiana	713	87	42	101,695.31	11,937.97	5,856.85	9,651.55	348.00	7,299.54	17,299.00
Minnesota	15,268	2,924	389	2,093,046.55	377,589.90	40,261.29	207,154.98	11,712.00	61,543.77	280,410.75
Montana	3,595	407	225	486,638.66	56,019.73	29,044.43	46,162.00	1,632.00	36,506.32	84,300.32
Nebraska	59,127	16,870	1,259	8,876,351.20	2,546,696.04	187,371.35	813,382.33	67,776.73	234,332.61	1,115,491.67
Nevada	46	1	.....	6,282.50	160.00	.....	614.00	4.00	.....	618.00
New Mexico	1,612	91	55	230,316.54	12,931.60	7,837.25	21,294.00	363.00	9,796.56	31,453.56
North Dakota	1,699	7,897	781	263,123.95	1,226,605.66	120,524.80	23,446.00	31,576.83	150,661.75	205,684.58
Oregon	7,126	1,502	252	1,051,235.21	224,545.60	35,902.61	95,821.00	6,028.00	44,878.37	146,721.37
South Dakota	2,925	13,764	822	449,583.61	2,121,733.58	121,890.98	40,151.00	55,036.00	152,282.89	247,269.89
Utah	1,476	138	89	179,690.74	15,556.26	10,157.44	17,925.00	552.00	12,696.85	31,173.85
Washington	9,354	2,006	588	1,362,193.51	292,727.52	75,689.54	125,615.00	8,020.00	94,770.83	228,405.83
Wisconsin	1	1	.....	40.00	40.00	.....	9.00	4.00	.....	13.00
Wyoming	3,123	333	125	459,556.42	50,543.08	15,288.29	41,904.00	1,332.00	19,135.91	62,367.91
Total	290,278	65,265	7,108	43,606,344.97	9,856,264.45	1,010,623.81	3,975,261.07	261,115.88	1,275,040.25	5,511,188.80

Land and scrip granted to States and territories for educational and other purposes.

State or territory.	Purpose of grant.	Amount granted.	Total by States.
		Acres.	
Alabama	Tuskegee Normal and Industrial Institute	25,000.00	
	Industrial School for Girls	25,000.00	
	Seminary of learning	46,080.00	
	Internal improvements, including river and shoals	500,000.00	
	Agricultural college scrip	240,000.00	
	Common schools, section 16	911,627.00	
	Salt springs and contiguous lands	23,040.00	
	Seat of government	1,620.00	
	University	46,080.00	
	Swamp	418,633.53	
	Swamp-land indemnity	20,920.08	
			2,258,000.61
Alaska	Common schools, sections 16 and 36, reserved (estimated)	21,009,209.00	
	Agricultural College and School of Mines, certain sections 33, reserved (estimated)	336,000.00	
			21,345,209.00
Arizona	University	246,080.00	
	Public buildings	100,000.00	
	Penitentiaries	100,000.00	
	Insane asylums	100,000.00	
	Deaf, dumb, and blind asylum	100,000.00	
	Miners' Hospital	50,000.00	
	Normal schools	200,000.00	
	Charitable, penal, etc	100,000.00	
	Agricultural and mechanical colleges	150,000.00	
	School of Mines	150,000.00	
	Military institutes	100,000.00	
	Payment of bonds issued to Maricopa, Pima, Yavapai, and Coconino Counties	1,000,000.00	
	Common schools, sections 2 and 32, 16 and 36	8,093,156.00	
			10,489,236.00
Arkansas	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	10,600.00	
	Agricultural college scrip	150,000.00	
	Common schools, section 16	933,778.00	
	Salt springs and contiguous lands	46,080.00	
	Swamp	7,686,335.37	
			9,372,873.37
California	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	6,400.00	
	Agricultural and mechanical colleges	150,000.00	
	Common schools, sections 16 and 36	5,534,293.00	
	Swamp	2,140,765.19	
			8,377,538.19
Colorado	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	32,000.00	
	Penitentiaries	32,000.00	
	Agricultural college	90,000.00	
	Common schools, sections 16 and 36	3,685,618.00	
	Salt springs and contiguous lands	46,080.00	
	State Agricultural College	1,600.00	
			4,433,378.00
Connecticut	Agricultural college scrip	180,000.00	
			180,000.00
Delaware	....do	90,000.00	
			90,000.00
Florida	Internal improvements	500,000.00	
	Seminaries of learning	92,160.00	
	Seat of government	5,120.00	
	Agricultural college scrip	90,000.00	
	Common schools, section 16	975,307.00	
	Swamp	20,201,660.52	
	Swamp-land indemnity	94,782.80	
			21,959,030.32
Georgia	Agricultural college scrip	270,000.00	
			270,000.00
Idaho	Lava Hot Springs	187.30	
	University	46,080.00	
	University, Moscow	50,000.00	
	Agricultural college	90,000.00	
	Penitentiary	50,000.00	
	Public buildings	32,000.00	
	Insane asylum	50,000.00	
	Educational, charitable, etc	150,000.00	
	Normal schools	100,000.00	
	Scientific schools	100,000.00	
	Common schools, sections 16 and 36	2,963,698.00	
			3,631,965.30

Land and scrip granted to States and territories, for educational and other purposes—Con.

State or territory.	Purpose of grant.	Amount granted.	Total by States.
		Acres.	
Illinois	Internal improvements, including canals	533,368.24	
	Seminary of learning	46,080.00	
	Seat of government	2,560.00	
	Agricultural college scrip	480,000.00	
	Common schools, section 16	996,320.00	
	Salt springs and contiguous lands	121,029.00	
	Swamp	1,457,399.20	
	Swamp land indemnity	2,309.07	
			3,639,065.51
Indiana	Internal improvements (canals and roads)	1,916,804.56	
	Seminary of learning	46,080.00	
	Seat of government	2,560.00	
	Agricultural college scrip	390,000.00	
	Common schools, section 16	668,578.00	
	Salt springs and contiguous lands	23,040.00	
	Swamp	1,254,270.73	
	Swamp land indemnity	4,880.20	
			4,306,213.49
Iowa	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	3,200.00	
	Agricultural college	240,000.00	
	Common schools, section 16	988,196.00	
	Salt springs and contiguous lands	46,080.00	
	Swamp	873,856.42	
	Swamp land indemnity	321,976.98	
			3,019,389.40
Kansas	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	6,400.00	
	Agricultural college	90,000.00	
	Do	7,682.00	
	Common schools, sections 16 and 36	2,907,520.00	
	Salt springs and contiguous lands	46,080.00	
	Game preserve	3,021.20	
			3,606,783.20
Kentucky	Deaf and Dumb Asylum	22,508.65	
	Agricultural college scrip	330,000.00	
			352,508.65
Louisiana	Internal improvements	500,000.00	
	Seminary of learning	46,080.00	
	Agricultural college scrip	210,000.00	
	Common schools, section 16	807,271.00	
	Swamp	9,380,569.59	
	Swamp land indemnity	32,630.97	
			10,976,551.56
Maine	Agricultural college scrip	210,000.00	210,000.00
Maryland	....do	210,000.00	210,000.00
Massachusetts	....do	360,000.00	360,000.00
Michigan	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	3,200.00	
	Agricultural college	240,000.00	
	Common schools, section 16	1,021,867.00	
	Salt springs and contiguous lands	46,080.00	
	Swamp	5,655,809.56	
	Swamp land indemnity	24,038.69	
	Canals	1,250,235.85	
			8,787,311.10
Minnesota	Internal improvements	500,000.00	
	University	92,160.00	
	Public buildings	6,400.00	
	Agricultural college	120,000.00	
	Experimental forestry	20,000.00	
	Public park	8,392.51	
	Common schools, sections 16 and 36	2,874,951.00	
	Salt springs and contiguous lands	46,080.00	
	Swamp	4,662,967.10	
			8,330,950.61
Mississippi	Internal improvements	500,000.00	
	Seminary of learning	69,120.00	
	Seat of government	1,253.16	
	Agricultural college scrip	210,000.00	
	Common schools, section 16	824,213.00	
	Swamp	3,285,859.02	
	Swamp land indemnity	56,781.76	
			4,947,226.94

Land and scrip granted to States and territories for educational and other purposes—Con.

State or territory.	Purpose of grant.	Amount granted.	Total by States.
		Acres.	
Missouri	Internal improvements	500,000.00	
	Seminary of learning	46,080.00	
	Seat of government	2,560.00	
	Agricultural college	330,000.00	
	Common schools, section 16	1,221,813.00	
	Salt springs and contiguous lands	46,080.00	
	Swamp	3,346,683.70	
	Swamp land indemnity	81,016.69	
			5,574,233.39
Montana	University	46,080.00	
	Agricultural college	140,000.00	
	Public buildings	182,000.00	
	Deaf and dumb asylum	50,000.00	
	Reform school	50,000.00	
	School of Mines	100,000.00	
	Normal schools	100,000.00	
	Militia camp	640.00	
	Observatory for university	480.00	
	Biological station	160.00	
	Common schools, sections 16 and 36	5,198,258.00	
	Fort Assiniboine, for educational institutions	2,000.00	
			5,869,618.00
Nebraska	Penitentiary	32,000.00	
	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	12,800.00	
	Agricultural college	90,000.00	
	Common schools, sections 16 and 36	2,730,951.00	
	Salt springs and contiguous lands	46,080.00	
	Dry-land agricultural experiments	800.00	
			3,458,711.00
Nevada	Internal improvements	500,000.00	
	University	46,080.00	
	Penitentiary	12,800.00	
	Public buildings	12,800.00	
	Mining and mechanic arts	90,000.00	
	Common schools, sections 16 and 36, and lieu lands, act June 16, 1880.	2,061,967.00	
			2,723,647.00
New Hampshire	Agricultural college scrip	150,000.00	150,000.00
New Jersey	....do	210,000.00	210,000.00
New Mexico (act June 21, 1898).	University	111,080.00	
	Saline land (university)	1,622.86	
	Agricultural college	100,000.00	
	Improvement of Rio Grande	100,000.00	
	Penitentiary	50,000.00	
	Public buildings	32,000.00	
	Insane asylum	50,000.00	
	Deaf and dumb asylum	50,000.00	
	Reform school	50,000.00	
	Normal schools	100,000.00	
	School of Mines	50,000.00	
	Blind asylum	50,000.00	
	Reservoirs	500,000.00	
	Miners' Hospital	50,000.00	
	Military institute	50,000.00	
	Common schools, sections 16 and 36	4,355,662.00	
			5,700,364.86
New Mexico (act June 20, 1910).	University	200,000.00	
	Public buildings	100,000.00	
	Insane asylums	100,000.00	
	Penitentiaries	100,000.00	
	Deaf, dumb, and blind asylum	100,000.00	
	Miners' hospitals	50,000.00	
	Normal schools	200,000.00	
	Charitable, penal, and reformatory	100,000.00	
	Agricultural and mechanical colleges	150,000.00	
	School of Mines	150,000.00	
	Military institutes	100,000.00	
	Payment of bonds issued by Grant and Santa Fe Counties.	1,000,000.00	
	Common schools, sections 2 and 32	4,355,662.00	
			6,705,662.00
New York	Agricultural college scrip	990,000.00	990,000.00
North Carolina	....do	270,000.00	270,000.00

Land and scrip granted to States and territories for educational and other purposes—Con.

State or territory.	Purpose of grant.	Amount granted.	Total by States.
		Acres.	
North Dakota	University	86,080.00	
	Agricultural college	130,000.00	
	Public buildings	82,000.00	
	Educational, charitable, etc	170,000.00	
	Deaf and dumb asylum	40,000.00	
	Reform school	40,000.00	
	School of Mines	40,000.00	
	Normal school	80,000.00	
	Common schools, sections 16 and 36	2,495,396.00	
			3,163,476.00
Ohio	Internal improvements (canals and roads)	1,019,071.98	
	Seminaries of learning	69,120.00	
	Agricultural college scrip	630,000.00	
	Common schools, section 16	724,266.00	
	Salt Springs and contiguous lands	24,216.00	
	Swamp	26,251.95	
			2,492,925.93
Oklahoma	Normal schools	300,000.00	
	Oklahoma University	250,000.00	
	University preparatory school	150,000.00	
	Agricultural and mechanical college	250,000.00	
	Colored Agricultural and Normal University	100,000.00	
	Common schools, sections 16 and 36	1,375,000.00	
	Certain sections 13 and 33	669,000.00	
	Insane asylum	1,760.25	
			3,095,760.25
Oregon	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	6,400.00	
	Agricultural college	90,000.00	
	Common schools, sections 16 and 36	3,399,360.00	
	Salt Springs and contiguous lands	46,080.00	
	Public park (area not yet determined)		
	Swamp	264,069.01	
			4,351,989.01
Pennsylvania	Agricultural college scrip	780,000.00	780,000.00
Rhode Island	....do	120,000.00	120,000.00
South Carolina	....do	180,000.00	180,000.00
South Dakota	University	86,080.00	
	Agricultural college	160,000.00	
	Public buildings	82,000.00	
	Educational and charitable	170,000.00	
	Deaf and dumb asylum	40,000.00	
	Reform school	40,000.00	
	School of Mines	40,000.00	
	Normal schools	80,000.00	
	Missionary work	160.00	
	Military camp ground	640.00	
	Insane asylum	640.00	
	Common schools, sections 16 and 36	2,733,084.00	
			3,432,604.00
Tennessee	Agricultural college scrip	300,000.00	300,000.00
Texas	....do	189,000.00	189,000.00
Utah	University	156,080.00	
	Agricultural college	200,000.00	
	Public buildings	64,000.00	
	Insane asylum	100,000.00	
	Deaf and dumb asylum	100,000.00	
	Reform school	100,000.00	
	School of Mines	100,000.00	
	Normal schools	100,000.00	
	Blind asylum	100,000.00	
	Reservoirs	500,000.00	
	Miners' Hospital	50,000.00	
	Common schools, sections 2, 16, 32, and 36	5,844,196.00	
			7,414,276.00
Vermont	Agricultural college scrip	150,000.00	150,000.00
Virginia	....do	300,000.00	300,000.00
Washington	University	46,080.00	
	Agricultural college	90,000.00	
	Public buildings	132,000.00	
	Educational and charitable	200,000.00	
	Normal schools	100,000.00	
	Scientific schools	100,000.00	
	Common schools, sections 16 and 36	2,376,391.00	
			3,044,471.00

Land and scrip granted to States and territories for educational and other purposes—Con.

State or territory.	Purpose of grant.	Amount granted.	Total by States.
		Acres.	
West Virginia	Agricultural college scrip	150,000.00	150,000.00
Wisconsin	Canal	338,626.97	
	River improvement	683,722.43	
	Internal improvements	500,000.00	
	University	92,160.00	
	Public buildings	6,400.00	
	Agricultural college	240,000.00	
	Forestry	20,000.00	
	Common schools, section 16	982,329.00	
	Swamp	3,251,563.94	
	Swamp-land indemnity	105,047.99	6,219,850.33
Wyoming	University	46,080.00	
	Agricultural college	90,000.00	
	Public buildings	107,000.00	
	Penitentiary	30,000.00	
	Insane asylum	30,000.00	
	Educational, penal, etc	290,000.00	
	Deaf and dumb asylum	30,000.00	
	Miners' Hospital	30,000.00	
	Fish hatcheries	5,480.00	
	Poor farm	10,000.00	
	Common schools, sections 16 and 36	3,470,009.00	4,138,569.00
	Grand total		202,319,389.02

Lands patented or certified under concessions by act of Congress to States and corporations for railroad and military wagon-road purposes from the year 1850 to June 30, 1919.

STATE GRANTS.

	Acres.
Illinois:	
Illinois Central	2,595,133.00
Mississippi:	
Mobile & Ohio River	737,130.29
Vicksburg & Meridian	199,101.51
Gulf & Ship Island	139,113.22
	1,075,345.02
Alabama:	
Mobile & Ohio	[1] 419,528.44
Alabama & Florida	399,022.84
Selma, Rome & Dalton	458,555.82
Coosa & Tennessee	67,784.96
Mobile & Girard	[2] 302,181.16
Alabama & Chattanooga	654,009.12
South & North Alabama	445,478.47
	2,746,560.81
Florida:	
Florida Central & Peninsular	741,668.27
Florida & Alabama	166,691.08
Pensacola & Georgia	1,279,236.70
Florida, Atlantic & Gulf Central	29,384.18
	2,216,980.23

[1] In the adjustment of this grant the road was treated as an entirety and without reference to the State line; hence Alabama has had approved to her more and Mississippi less than they would appear to be entitled to in proportion to the length of the road in the respective States.

[2] This grant was adjusted Apr. 24, 1893, and 302,181.16 acres were allotted to the company. The balance of the previously certified lands were ordered restored to entry under the forfeiture act of Sept. 29, 1890.

	Acres.
Louisiana:	
Vicksburg, Shreveport & Pacific	372,092.34
New Orleans, Opelousas & Great Western	(1)
Arkansas:	
St. Louis, Iron Mountain & Southern	1,325,355.46
Little Rock & Fort Smith	1,052,082.51
Memphis & Little Rock	184,657.33
	2,562,095.30
Missouri:	
Southwest branch of the Pacific road	1,161,284.51
Hannibal & St. Joseph	611,323.35
St. Louis, Iron Mountain & Southern	65,360.31
	1,837,968.17
Iowa:	
Burlington & Missouri River	389,990.11
Chicago, Rock Island & Pacific	[2] 483,214.36
Cedar Rapids & Missouri River	161,532.81 [2] 922,824.85 244,022.96
Dubuque & Sioux City	[2] 556,406.74
Iowa Falls & Sioux City	683,057.34
Des Moines Valley (river-improvement grant)	840,171.36
Chicago, Milwaukee & St. Paul	326,216.10
McGregor & Missouri River Sioux City & St. Paul	322,412.81
	4,929,849.44
Michigan:	
Port Huron & Lake Michigan	37,467.44
Jackson, Lansing & Saginaw	743,787.58
Grand Rapids & Indiana	852,521.10
Flint & Pere Marquette	512,932.38
Marquette, Houghton & Ontonagon	[3] 305,929.59
Ontonagon & Brule River	34,227.08
Bay de Noquet & Marquette	128,301.05
Chicago & North Western	518,065.36
	3,133,231.58
Wisconsin:	
Chicago, St. Paul, Minneapolis & Omaha (formerly West Wisconsin)	813,706.71
Wisconsin Railroad Farm Mortgage Land Co	163,159.65
Chicago, St. Paul, Minneapolis & Omaha (formerly St. Croix & Lake Superior)	816,487.76
Branch to Bayfield	471,721.14
Chicago & North Western	546,446.20
Wisconsin Central	838,227.69
	3,649,749.15

[1] Certified lands footing 719,189.79 acres were reconveyed to the United States by the governor of Louisiana Feb. 24, 1888, the grant having been forfeited by the act of July 14, 1870 (16 Stat., 277).

[2] Includes 35,685.49 acres of the Chicago, Rock Island & Pacific R. R.; 109,756.85 acres of the Cedar Rapids & Missouri River R. R.; and 77,535.32 acres of the Dubuque & Sioux City R. R., situated in the old Des Moines River grant of Aug. 8, 1846, which should be deducted from the foregoing amount. (Wolcott *v.* Des Moines Co., 5 Wall., 631.)

[3] Excess of 131,181.71 acres originally certified under this grant reconveyed by State or entered under act Mar. 3, 1887, by Michigan Land & Iron Co. (Ltd.), grant having been forfeited in part by act March, 1889 (25 Stat., 1008).

	Acres.
Minnesota:	
St. Paul, Minneapolis & Manitoba (formerly first division St. Paul & Pacific); Western R. R. (succeeded by St. Paul & Northern Pacific R. R. Co.); St. Paul, Minneapolis & Manitoba (formerly St. Vincent extension of the St. Paul & Pacific)	13,259,263.84
Minnesota Central	179,734.29
Winona & St. Peter	1,680,974.92
St. Paul & Sioux City	1,126,618.55
St. Paul & Duluth	860,973.62
Southern Minnesota, from a point on the Mississippi River to Houston; Southern Minnesota extension (now Chicago, Milwaukee & St. Paul)	546,745.44
Hastings & Dakota	377,776.15
	8,032,086.81
Minnesota, North Dakota, Montana, and Washington:	
St. Paul, Minneapolis & Manitoba, now Great Northern (main and branch), a special act (Aug. 5, 1892, 27 Stat., L., 390) to provide for indemnity for lands relinquished by the company	(2)
Kansas:	
Leavenworth, Lawrence & Galveston	[3] 249,446.13
Missouri, Kansas & Texas	[4] 976,593.22
Atchison, Topeka & Santa Fe	2,944,788.14
St. Joseph & Denver City	462,933.24
	4,633,760.73
Grand total	37,784,852.58

CORPORATION GRANTS.

Union Pacific	11,934,047.39
Central Pacific	6,446,635.07
Central Pacific (successor by consolidation with Western Pacific)	458,786.66
Central Branch Union Pacific	223,080.50
Union Pacific (Kansas division)	6,175,660.63
Union Pacific (successor to Denver Pacific Ry. Co.)	807,564.76
Burlington & Missouri River in Nebraska	2,374,090.77
Sioux City & Pacific (now Missouri Valley Land Co.)	42,610.95
Northern Pacific	38,075,479.30
Oregon Branch of the Central Pacific (California & Oregon)	3,161,465.34
Oregon & California	2,776,170.55
Atlantic & Pacific (now Sante Fe Pacific)	7,321,137.81
Southern Pacific (main line)	4,048,811.96
Southern Pacific (branch line)	1,583,304.81
Oregon Central	128,618.13
New Orleans Pacific	1,001,943.40
Grand total	86,559,408.03

WAGON ROADS.

From Lake Erie to Connecticut Western Reserve	80,773.54
From Lake Michigan to Ohio River	170,580.24
From Fort Wilkins, Copper Harbor, Mich., to Green Bay, Wis	302,930.96
From Fort Wilkins, Copper Harbor, Mich., to Wisconsin State line	221,013.35
Oregon Central Military Co. (now California & Oregon Land Co.)	859,579.89
Corvallis and Yaquina Bay	83,716.76
Willamette Valley and Cascade Mountain	861,511.86
Dalles Military Road	556,827.04
Coos Bay Military Road	105,240.11
Grand total	3,242,173.75

[1] Declared to be one grant (see 32 L. D., 21).
[2] See Minnesota for original grants.
[3] Includes 186,936.72 acres of the "Osage ceded reservation," which are to be deducted from the above amount under the decision of the Supreme Court in the case of the Leavenworth, Lawrence & Galveston Railroad *v.* The United States (92 U. S. 733).
[4] Includes 270,970.78 acres in the "Osage ceded reservation," which are to be deducted under the decision cited in note 4.

Lands certified or patented on account of railroad and wagon-road grants during the fiscal year ended June 30, 1919.

Grant.	State.	Area.
CORPORATIONS.		
		Acres.
Atlantic & Pacific, now Santa Fe Pacific R. R. Co.	Arizona	6,992.68
Do	New Mexico	311,559.55
California & Oregon R. R. Co.	California	1,386.27
Central Pacific R. R.	do	3,175.88
Do	Idaho	3,182.39
Do	Nevada	233,043.02
Do	Utah	12,733.32
Northern Pacific Ry.	Minnesota	264.41
Do	Oregon	2,575.89
Do	Washington	48,893.70
Oregon & California R. R.[1]	Oregon	8,477.29
Total		632,284.40

[1] The tracts patented under this grant were sold by the company to purchasers prior to July 1, 1913, the date fixed in the revestment act of June 9, 1916 (39 Stat., 218).

Total patented during the year	632,284.40
Total canceled during year	20,549.57
Total disposed of during year	652,833.97
Total received during year	529,900.03

Withdrawals under the act of Mar. 15, 1910 (36 Stat., 237), during the fiscal year ended June 30, 1919.

State.	Pending July 1, 1918.	Applied for 1918–19.	Rejected before withdrawal, 1918–19.	Pending July 1, 1919.	Remaining withdrawn July 1, 1918.	Withdrawn 1918–19.	Restored 1918–19.	Remaining withdrawn July 1, 1919.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Arizona					18,240.00			18,240.00
Colorado	14,411.17		160.00	14,251.17	69,333.88		39,625.73	29,708.15
Idaho		21,164.77		21,164.77	21,164.77			21,164.77
Montana								
Nevada					4,521.56		4,521.56	
New Mexico								
Oregon	909.91			909.91	75,497.64			75,497.64
Utah								
Wyoming	4,065.49	995.99	1,264.49	2,800.00	24,233.83	995.99	4,375.39	20,854.43
Total	19,385.57	22,160.76	1,424.49	39,125.85	212,991.68	995.99	48,522.68	165,464.99

State desert-land segregations under section 4 of the act of Aug. 18, 1894 (28 Stat., 372-422), and the acts amendatory thereof, commonly designated as the Carey Act, with the action taken thereon during the fiscal year ended June 30, 1919.

State.	Pending July 1, 1918.	Applied for 1918–19.	Rejected before segregation, 1918–19.	Pending July 1, 1919.	Remaining segregated July 1, 1918.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Arizona	13,905.16		2,991.81	10,913.35	
Colorado	77,204.86		32,588.91	44,615.95	190,806.28
Idaho	477,555.10		457,683.18	19,871.92	476,280.43
Montana	33,913.92			33,913.92	118,448.28
Nevada	5,440.00			5,440.00	12,246.02
New Mexico					7,564.68
Oregon	95,427.07			95,427.07	224,672.09
Utah	183,533.73			183,533.73	59,854.59
Wyoming	115,831.21		15,588.58	109,659.21	941,922.09
Total	1,002,811.05		508,852.48	503,375.15	2,031,794.46

State desert-land segregations under section 4 of the act of Aug. 18, 1894, etc.—Contd.

State.	Segregated 1918–19.	Canceled 1918–19.	Patented 1918–19.	Time to reclaim extended.	Remaining segregated July 1, 1919.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Arizona					
Colorado		6,706.18	1,791.10		182,309.00
Idaho		640.00	19,560.31		456,080.12
Montana		34.94	35,582.64		82,830.70
Nevada					12,246.02
New Mexico					7,564.68
Oregon					224,672.09
Utah					59,854.59
Wyoming	3,536.15	13,089.50	11,168.65	232,709.51	921,200.09
Total	3,536.15	20,470.62	68,102.70	232,709.51	1,946,757.29

Withdrawals and restorations.

COAL LAND.

State.	Withdrawals outstanding June 30, 1918.	Fiscal year ended June 30, 1919.		Withdrawals outstanding June 30, 1919.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	141,945			141,945
California	17,643			17,643
Colorado	4,503,417		5,041	4,498,376
Idaho	338,452		333,691	4,761
Montana	10,912,569		300,457	10,612,112
Nevada	83,833			83,833
New Mexico	5,603,894	9,369	27,019	5,586,244
North Dakota	14,656,455		423,954	14,232,501
Oregon	4,361			4,361
Utah	5,326,256		12,181	5,314,075
Washington	827,193		3,119	824,074
Wyoming	2,437,723		160	2,437,563
Total	44,853,741	9,369	1,105,622	43,757,488

OIL LANDS.

Arizona	230,400			230,400
California	1,257,229			1,257,229
Colorado	87,474			87,474
Louisiana	467,030			467,030
Montana	1,346,105			1,346,105
North Dakota	84,894			84,894
Utah	1,952,326	10,461		1,962,787
Wyoming	923,182	160,835	117	1,083,900
Total	6,348,640	171,296	117	6,519,819

PHOSPHATE LAND.

Florida	119,737			119,737
Idaho	966,377	49,340		1,015,717
Montana	119,227	198,690	30,034	287,883
Utah	302,465			302,465
Wyoming	998,592			998,592
Total	2,506,398	248,030	30,034	2,724,394

Report of withdrawals made under the act of June 25, 1910 (36 Stat., 847), as amended by act of Aug. 24, 1912 (37 Stat., 497), and the restorations therefrom, from July 1, 1918, to June 30, 1919.

POWER SITE RESERVES.

State.	Withdrawals.			Restorations.			Outstanding.	
	No.	Date of approval.	Area.	No.	Date of approval.	Area.	July 1, 1918.	June 30, 1919.
			Acres.			*Acres.*		
Alabama							120	120
Alaska							81,015	81,015
Arkansas							22,354	22,354
Arizona	691	Sept. 6, 1918	37	267	Aug. 20, 1918	4,362	300,368	295,738
	719	May 24, 1919	554	269	Oct. 16, 1918	600		
				270	do	259		
			591			5,221		
California	693	Sept. 11, 1918	1,508	271	Oct. 16, 1918	78		
	695	Oct. 4, 1918	160					
	696	Oct. 15, 1918	8,900					
	699	Dec. 2, 1918	40					
	700	do	55					
	701	do	385					
	704	Feb. 25, 1919	480					
	706	do	36					
	707	do	145					
	713	Mar. 25, 1919	40				277,223	288,894
			11,749			78		
Colorado	703	Feb. 25, 1919	542				276,514	277,056
Idaho				262	July 19, 1918	78		
				263	July 25, 1918	1,604		
				264	July 26, 1918	378		
				274	July 25, 1919	96		
				278	Feb. 25, 1919	58		
				276	Apr. 8, 1919	4,480		
				279	May 11, 1919	300	265,467	258,473
						6,994		
Michigan							1,240	1,240
Minnesota							12,309	12,309
Montana	702	Dec. 2, 1918	27	280	May 17, 1919	8	164,412	164,431
Nebraska							761	761
Nevada	692	Aug. 14, 1918	17					
	716	May 4, 1919	165				27,361	27,543
			182					
New Mexico							62,602	62,602
Oregon	707	Feb. 25, 1919	1,760	265	July 27, 1918	160		
				272	Oct. 25, 1918	80		
				279	May 11, 1919	388		
				280	May 17, 1919	360	421,972	422,744
			1,760			988		
Utah	698	Nov. 16, 1918	518	273	Nov. 5, 1918	139		
	685	Apr. 22, 1919	1,674	275	Feb. 28, 1919	1,000		
	711	Feb. 25, 1919	157	279	May 11, 1919	142	447,628	448,696
			2,349			1,281		
Washington				266	July 27, 1918			
				268	Sept. 10, 1918	65		
				282	June 30, 1919	220	113,533	113,248
						285		
Wyoming				277	May 4, 1919	1,182	89,493	88,311
Total			17,200			16,037	25,643,372	2,565,535

Report of withdrawals made under the act of June 25, 1910, etc.—Continued.

PUBLIC WATER RESERVES.

State.	Withdrawals.			Restorations.			Outstanding.	
	No.	Date of approval.	Area.	No.	Date of approval.	Area.	July 1, 1918.	June 30, 1919.
			Acres.			*Acres.*		
Arizona	55	Aug. 28, 1918	720	13	Sept. 10, 1918	200		
	59	Feb. 25, 1919	360	15	Jan. 11, 1919	80		
				16	Apr. 8, 1919	40	13,066	13,826
			1,080			320		
California	56	Oct. 16, 1918	3,560				52,474	56,034
Colorado	60	Feb. 25, 1919	1,040	17	June 30, 1919	40		
	62	Apr. 8, 1919	100					
	64	June 5, 1919	320				480	2,900
			1,460					
Idaho				19	May 24, 1919	170	7,210	7,040
Montana	57	Jan. 1, 1919	125	14	Sept. 20, 1918	45		
	62	Apr. 8, 1919	1,800					
	63	Apr. 30, 1919	40					
	64	June 5, 1919	100				5,264	7,284
			2,065					
Nevada	62	Apr. 8, 1919	80				4,753	4,833
New Mexico	50	Oct. 3, 1918	355	17	June 30, 1919	40		
	63	Apr. 30, 1919	120				2,926	3,361
			475					
Oregon	61	Feb. 25, 1919	5,320					
	63	Apr. 30, 1919	840					
	64	June 5, 1919	3,102				2,482	11,744
			9,262					
South Dakota	62	Apr. 8, 1919	240					240
Utah	63	Apr. 30, 1919	240				34,627	34,867
Washington	63	....do....	720	16	Apr. 8, 1919	40		
	64	June 5, 1919	40				40	760
			760					
Wyoming	58	Feb. 25, 1919	1,920	17	June 30, 1919	320		
	63	Apr. 30, 1919	440					
	64	June 5, 1919	840				81,312	84,192
			3,200					
Total			22,422			975	204,634	226,081

WELL DRILLING RESERVOIRS.

Montana							40	40
Nevada							80	80
Total							120	120

RESERVOIR SITES.

Montana							9,080	9,080
North Dakota							478	478
Oregon							10,619	10,619
Washington							35,943	35,943
Wyoming							5,020	5,020
Total							61,140	61,140

Report of withdrawals made under the act of June 25, 1910, etc.—Continued.

INDIAN POWER SITE.

State.	Withdrawals.			Restorations.				
	No.	Date of approval.	Area.	No.	Date of approval.	Area.	Outstanding.	
							July 1, 1918.	June 30, 1919.
			Acres.			*Acres.*		*Acres.*
Wyoming	804447	Sept. 27, 1918	19,000				(1)	19,000

MISCELLANEOUS RESERVATIONS.

Alabama				694948	July 20, 1918	19,600	19,600	
Alaska							230,000	230,000
California							30,880	30,880
Colorado							1,727	1,727
Oregon							1,850,000	1,850,000
Washington	803678	Sept. 16, 1918	560					560
Total			560			19,600	2,132,207	2,113,167

[1] Between Aug. 17, 1910, and July 19, 1915, six Indian power site withdrawals have been made by Executive order, but because no area was given in any of such withdrawals they have not been reported in previous reports.

Withdrawals and restorations, under the act of June 17, 1902 (32 Stat., 388), and the acts amendatory of and supplemental thereto, for the fiscal year ending June 30, 1919.

State.	Project.	Withdrawals.	Restorations.
		Acres.	*Acres.*
California	Yuma	143,760	360
	Klamath	64,380	
	Newlands		240
	Stanislaus Reservoir	7,040	
	Iron Canyon		80
		215,180	680
Colorado	Uncompahgre Valley		160
	Colorado River Storage		160
	Grand Valley		1,280
			1,600
Idaho	Boise	21,520	600
	Minidoka	120	3,800
	Bruneau	567,460	
	Mountain Home	768,241	
	Dubois		23,160
		1,357,340	27,560
Montana	Milk River	800	14,880
	Sun River	3,840	23,380
	Fort Peck		120
	Reservoir Site No. 26		2,640
	St. Mary Survey		320
		4,640	41,340
New Mexico	Colorado River Storage	2,240	
	Rio Grande		360
	Red Bluff Reservoir Site		320
		2,240	680
North Dakota	Buford-Trenton		40
	Lower Yellowstone		40
			80

Withdrawals and restorations, under the act of June 17, 1902, etc.—Continued.

State.	Project.	Withdrawals.	Restorations.
		Acres.	*Acres.*
Oregon	John Day	80	
	Klamath	280	
	Deschutes	81,040	80
		81,400	80
South Dakota	Bellefourche		40
Utah	Castle Peak	83,200	
	Colorado River Storage	64,480	
	Strawberry Valley		80
		147,680	80
Washington	Yakima	70,320	41,400
	Palouse		320
		70,320	41,720
Wyoming	Wind River	361,160	
	North Platte	80	840
	Shoshone		2,800
		361,240	3,640
Arizona	Yuma		320
	Salt River		400
	Sentinel	739,200	320
	Colorado River Storage	404,480	
		1,143,680	1,040
Nebraska	North Platte		1,300
Nevada	Colorado River Storage	485,120	
	Newlands		400
		485,120	400
	Total acreage	3,868,840	120,240

Hydroelectric power projects—Payments made pursuant to permits and easements granted under the act of Feb. 15, 1901 (31 Stat., 790), and Mar. 4, 1911 (36 Stat., 1253), respectively, during fiscal year ending June 30, 1919.

State or Territory.	Permittee or grantee.	Character of grant or permit.	Project.	Payment.
Alaska	Alaska Gastineau Mining Co	Final	Power	$2,320.00
Arizona	Arizona Gas & Electric Co	do	Transmission	30.00
Do	New Comcia Copper Co	do	do	30.00
Do	Arizona Power Co	do	do	565.00
Do	Gila Copper Sulphide Co	do	do	15.00
Do	Calumet & Arizona Mining Co	do	do	20.00
California	Southern Sierras Power Co	do	do	1,360.00
Do	Southern California Edison Co	do	do	197.50
Do	Truckee River General Electric Co	do	do	70.28
Do	Mountain King Mining Co	do	Power	105.00
Do	Mount Konocti Light & Power Co	do	Transmission	1.39
Colorado	Western Colorado Power Co	do	do	1,418.00
Idaho	Washington Water Power Co	do	do	20.00
Montana	Montana Power Co	do	do	817.00
Do	Great Falls Power Co	do	do	530.00
Do	Chicago, Milwaukee & St. Paul Ry. Co	do	do	75.00
Do	Mission Range Power Co	do	Power	66.00
Nevada	Nevada Valleys Power Co	do	Transmission	270.00
New Mexico	Wilfony (C. G.) Power Project	Preliminary	Power	6.39
Utah	Vernal Mining & Light Co	Final	Transmission	150.00
Washington	Black Rock Power & Irrigation Co	do	do	35.00
Wyoming	Fremont Power Co	do	do	.51
Total				8,102.07

Public and Indian lands entered each year ended June 30, from 1911 to 1919, inclusive.

State or Territory.	1913	1914	1915	1916	1917	1918	1919
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Alabama	56,245.68	39,485.65	25,154.63	21,229.16	14,255.54	9,310.44	14,438.87
Alaska	103.67	3,144.15	22,036.02	33,940.98	32,741.40	12,977.93	6,795.73
Arizona	770,449.59	765,962.11	291,557.70	1,881,044.63	1,431,627.45	1,236,786.93	512,885.03
Arkansas	178,065.19	174,665.29	165,080.01	184,359.50	160,645.85	97,476.05	78,787.28
California	937,230.43	878,874.21	1,001,663.53	640,361.85	754,964.55	288,041.59	520,592.84
Colorado	1,458,107.84	1,433,305.88	2,666,068.22	3,076,601.22	2,092,705.73	1,301,908.88	1,724,364.07
Florida	96,277.34	70,302.88	66,988.42	58,455.29	43,624.78	36,319.10	21,025.83
Idaho	1,030,312.55	947,553.93	1,144,276.80	1,066,352.41	769,455.55	556,668.62	653,513.08
Illinois							
Indiana							
Iowa							
Kansas	68,775.11	41,651.71	68,190.59	212,288.36	114,772.39	46,457.75	47,739.47
Louisiana	16,309.44	19,781.87	15,618.56	18,358.07	16,545.15	13,714.36	7,447.88
Michigan	13,636.92	16,900.73	14,981.80	10,751.32	9,570.89	6,913.21	7,222.50
Minnesota	191,762.18	323,305.20	298,534.64	268,140.25	109,455.90	59,877.25	158,891.40
Mississippi	20,599.64	19,918.35	18,007.56	18,381.11	15,205.05	10,443.24	7,808.98
Missouri	4,470.06	2,813.91	2,572.69	1,744.36	1,324.89	320.00	400.00
Montana	4,717,117.51	5,386,954.28	4,187,364.36	4,038,658.80	4,206,095.60	2,659,880.77	1,659,085.88
Nebraska	997,812.22	1,037,342.10	372,323.52	219,504.29	109,825.04	66,203.38	47,614.90
Nevada	173,799.60	194,308.33	290,138.53	212,554.83	92,871.29	124,540.78	292,873.53
New Mexico	2,324,250.89	1,870,138.66	3,266,995.81	2,831,204.86	1,850,779.81	1,033,681.76	2,205,491.33
North Dakota	418,685.76	604,264.16	365,719.63	337,089.13	321,494.13	148,158.36	78,466.68
Oklahoma	65,959.39	51,568.38	50,953.86	54,043.83	57,934.20	33,275.23	30,448.30
Oregon	561,810.14	839,990.89	738,401.77	561,739.40	428,255.14	252,666.17	421,335.07
South Dakota	468,658.33	378,469.32	321,763.13	1,045,854.96	1,213,326.90	338,745.18	714,700.29
Utah	262,863.44	189,781.34	373,507.39	335,101.87	461,178.17	284,224.35	212,688.24
Washington	357,323.51	294,930.73	324,384.09	188,488.08	433,158.16	185,778.80	191,296.47
Wisconsin	11,300.18	10,430.11	8,116.32	5,615.18	4,026.53	3,613.57	2,577.32
Wyoming	665,255.75	927,007.95	760,815.11	1,721,289.23	1,455,954.22	1,166,347.91	2,252,690.48
Gen. Land Office	40.00						
Total	15,867,222.45	16,522,852.12	16,861,214.69	19,043,152.92	16,201,794.38	9,974,331.61	11,871,181.50

Public lands surveyed and remaining unsurveyed in public land States, including Alaska.

	Land area.	Surveyed during fiscal year ending June 30, 1919.	Surveyed to June 30, 1919.	Unsurveyed to June 30, 1919.	Resurveyed during fiscal year ending June 30, 1919.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Alabama	32,818,560		32,818,560		
Alaska	378,165,760	97,970	1,144,449	377,021,311	
Arizona	72,838,400	1,762,639	31,028,155	41,810,245	
Arkansas	33,616,000	36	33,616,000		
California	99,617,280	179,777	80,759,237	18,858,043	8,158
Colorado	66,341,120	53,169	63,616,630	2,724,490	279,009
Florida	35,111,040	66	35,111,040		
Idaho	53,346,560	701,877	35,577,734	17,768,826	23,040
Illinois	35,867,520		35,867,520		
Indiana	23,068,800		23,068,800		
Iowa	35,575,040		35,575,040		
Kansas	52,335,360		52,335,360		
Louisiana	29,061,760		29,061,760		
Michigan	36,787,200		36,787,200		
Minnesota	51,749,120	44	51,749,120		
Mississippi	29,671,680	235	29,671,680		
Missouri	43,985,280		43,985,280		
Montana	93,568,640	1,644,232	76,131,532	17,437,108	
Nebraska	49,157,120		49,157,120		322,035
Nevada	70,285,440	219,045	44,307,701	25,977,739	
New Mexico	78,401,920	1,036,736	60,394,281	18,007,639	55,727
North Dakota	44,917,120		44,917,120		
Ohio	26,073,600		26,073,600		
Oklahoma	44,424,960		44,424,960		
Oregon	61,188,480	447,364	53,216,194	7,972,286	19,209
South Dakota	49,195,520	57,513	48,830,141	365,379	
Utah	52,597,760	251,089	33,024,554	19,573,206	
Washington	42,775,040	152,106	34,733,184	8,041,856	
Wisconsin	35,363,840		35,363,840		
Wyoming	62,460,160	9,615	58,789,162	3,670,998	347,823
Total	1,820,366,080	6,613,513	1,261,136,954	559,229,126	1,055,001

NOTE.—In Arkansas, Florida, Minnesota, and Mississippi the lands surveyed last year were not regarded as public land when the surrounding lands were originally surveyed, and are counted in the aggregate or each State.

Estimated area of existing national forests, June 30, 1919.

[A little over 88 per cent is public.]

	Acres.
Alabama	66,008
Alaska	20,713,204
Arizona	12,076,769
Arkansas	1,469,906
California	24,003,190
Colorado	14,748,943
Florida	675,420
Idaho	19,034,782
Maine	30,640
Michigan	163,878
Minnesota	1,581,014
Montana	18,947,290
Nebraska	217,808
Nevada	5,251,030
New Hampshire	403,737
New Mexico	9,486,806
North Carolina	88,202
Oklahoma	61,640
Oregon	15,397,726
Porto Rico	65,950
South Dakota	1,313,221
Utah	7,945,025
Virginia	261,274
Washington	11,624,374
West Virginia	13,701
Wyoming	8,619,855
Total area	174,261,393

	Acres.
Area added to national forests during year	83,702
Area excluded from national forests during year	1,658,988
Decrease in area through recomputation by Forest Service	114,587
Area within temporary forest withdrawals, June 30, 1919	746,568
Area of existing national forests, June 30, 1918	175,951,266
Area of existing national forests, June 30, 1919	174,261,393

National forests, by States, together with estimated areas thereof, June 30, 1919.

State or Territory.	Forest.	Area.
		Acres.
Alabama	Alabama	66,008
Alaska	Chugach	5,232,204
	Tongass	15,481,000
Total		20,713,204
Arizona	Apache	1,276,400
	Coconino	1,763,397
	Coronado[1]	1,357,828
	Crook	885,000
	Dixie[1]	17,680
	Kaibab	752,900
	Prescott	1,619,955
	Sitgreaves	893,720
	Tonto	2,033,760
	Tusayan	1,476,129
Total		12,076,769
Arkansas	Arkansas	958,290
	Ozark	511,616
Total		1,469,906
California	Angeles	1,058,532
	California	1,062,622
	Cleveland	813,616
	Crater[1]	57,022
	Eldorado[1]	835,800
	Inyo[1]	1,249,282
	Klamath[1]	1,734,665
	Lassen	1,321,343
	Modoc	1,582,859
	Mono[1]	874,861
	Monterey	360,494
	Plumas	1,432,860
	Santa Barbara	1,928,294
	Sequoia	2,021,609
	Shasta	1,586,880
	Sierra	1,662,560
	Siskiyou[1]	401,795
	Stanislaus	1,104,412
California	Tahoe[1]	1,167,537
	Trinity	1,746,147
Total		24,003,190
Colorado	Arapaho	680,021
	Battlement	672,238
	Cochetopa	930,220
	Colorado	1,149,594
	Durango	704,000
	Gunnison	951,310
	Hayden[1]	72,000
	Holy Cross	605,700
	La Sal[1]	27,620
	Leadville	1,056,520
	Montezuma	812,100
	Pike	1,256,112
	Rio Grande	1,221,140
	Routt	819,278
	San Isabel	651,200
	San Juan	745,000
	Sopris	656,000
	Uncompahgre	867,860
	White River	871,030
Total		14,748,943
Florida	Florida	675,420
Idaho	Boise	1,118,114
	Cache[1]	507,779
	Caribou[1]	711,630
	Challis	1,269,292
	Clearwater	907,846
	Coeur d'Alene	790,234
	Idaho	1,187,541
	Kaniksu[1]	325,642
	Lemhi	1,100,562
	Minidoka[1]	531,120
	Nezperce	1,666,079
	Payette	863,674
	Pend Oreille	874,738
	St. Joe	871,988

[1] Forest in two States.

National forests, by States, together with estimated areas thereof, June 30, 1919—Contd.

State or Territory	Forest	Area.
		Acres.
Idaho	Salmon	1,643,360
	Sawtooth	1,177,821
	Selway	1,802,000
	Targhee [1]	1,025,740
	Weiser	659,622
Total		19,034,782
Maine	White Mountain [1]	30,640
Michigan	Michigan	163,878
Minnesota	Minnesota	312,476
	Superior	1,268,538
Total		1,581,014
Montana	Absaroka	987,710
	Beartooth	681,930
	Beaverhead	1,365,000
	Bitterroot	1,155,868
	Blackfeet	1,128,615
	Cabinet	1,043,224
	Custer	499,508
	Deerlodge	964,000
	Flathead	2,004,579
	Gallatin	909,430
	Helena	888,631
	Jefferson	1,175,685
	Kootenai	1,617,140
	Lewis and Clark	826,360
	Lolo	1,181,018
	Madison	1,035,860
	Missoula	1,368,191
	Sioux [1]	114,541
Total		18,947,290
Nebraska	Nebraska	217,808
Nevada	Dixie [1]	63,410
	Eldorado [1]	400
	Humboldt	1,468,218
	Inyo [1]	58,777
	Mono [1]	483,519
	Nevada	1,197,061
	Tahoe [1]	54,845
	Toiyabe	1,924,800
Total		5,251,030
New Hampshire	White Mountain [1]	403,737
New Mexico	Carson	925,301
	Coronado [1]	129,152
	Datil	2,941,202
	Gila	1,600,000
	Lincoln	1,471,839
	Manzano	927,919
	Santa Fe	1,491,393
Total		9,486,806
North Carolina	Pisgah	88,202
Oklahoma	Wichita	61,640
Oregon	Cascade	1,094,485
	Crater [1]	1,079,325
	Deschutes	1,463,840
	Fremont	935,714
	Klamath [1]	8,893
	Malheur	1,262,840
	Minam	482,699
	Ochoco	819,030
Oregon	Oregon	1,140,866
	Santiam	719,983
	Siskiyou [1]	1,255,250
	Siuslaw	833,441
	Umatilla	564,985
	Umpqua	1,221,391
	Wallowa	1,053,537
	Wenaha [1]	461,954
	Whitman	999,493
Total		15,397,726
Porto Rico	Luquillo	65,950
South Dakota	Black Hills [1]	602,011
	Harney	627,942
	Sioux [1]	83,268
Total		1,313,221
Utah	Ashley [1]	981,613
	Cache [1]	317,506
	Dixie [1]	466,141
	Fillmore	279,290
	Fishlake	723,591
	La Sal [1]	524,715
	Manti	855,722
	Minidoka [1]	92,280
	Powell	704,700
	Sevier	799,855
	Uinta	1,043,135
	Wasatch	656,477
Total		7,945,025
Virginia	Natural Bridge	107,038
	Shenandoah [1]	154,236
Total		261,274
Washington	Chelan	724,110
	Columbia	942,200
	Colville	816,000
	Kaniksu [1]	376,763
	Okanogan	1,541,000
	Olympic	1,652,000
	Rainier	1,561,470
	Snoqualmie	1,042,000
	Washington	1,490,000
	Wenaha [1]	321,831
	Wenatchee	1,157,000
Total		11,624,374
West Virginia	Shenandoah [1]	13,701
Wyoming	Ashley [1]	6,060
	Bighorn	1,136,200
	Black Hills [1]	179,121
	Bridger	717,977
	Caribou [1]	7,360
	Hayden [1]	365,620
	Medicine Bow	511,382
	Shoshone	1,609,000
	Targhee [1]	339,070
	Teton	1,971,192
	Washakie	864,873
	Wyoming	912,000
Total		8,619,855
Total of 151 national forests.		174,261,393

[1] Forest in two States.

List of bird reserves.

Name of reservation.	Date.	Location.	Area.
			Acres.
Pelican Island	Mar. 14, 1903	East Florida coast	5.50
Breton Island	Oct. 4, 1904 Nov. 11, 1905	Southeast coast of Louisiana	Unknown.
Stump Lake	Mar. 9, 1905	North Dakota	27.39
Huron Islands	Oct. 10, 1905	Lake Superior, Mich	Unknown.
Siskiwit Islands	do	do	Do.
Passage Key	do	Tampa Bay, Fla	36.37
Indian Key	Feb. 10, 1906	do	90.00
Tern Islands	Aug. 8, 1907	Mouths of Mississippi River, La	Unknown.
Shell Keys	Aug. 17, 1907	South Louisiana coast	Do.
Three Arch Rocks	Oct. 14, 1907	West Oregon coast	Do.
Flattery Rocks	Oct. 23, 1907	West Washington coast	Do.
Quillayute Needles	do	do	Do.
Copalis Rock	do	do	Do.
East Timbalier Island	Dec. 7, 1907	South Louisiana coast	Do.
Mosquito Inlet	Feb. 24, 1908	East Florida coast	Do.
Tortugas Keys	Apr. 6, 1908	Florida Keys, Fla	Do.
Klamath Lake	Aug. 8, 1908	Oregon and California	Do.
Key West	do	Florida Keys, Fla	Do.
Lake Malheur	Aug. 18, 1908	Oregon	Do.
Chase Lake	Aug. 28, 1908	North Dakota	Do.
Pine Island	Sept. 15, 1908	West Florida coast	Do.
Matlatcha Pass	Sept. 26, 1908	do	Do.
Palma Sola	do	do	Do.
Island Bay	Oct. 23, 1908	Florida	Do.
Loch Katrine	Oct. 26, 1908	Wyoming	Do.
Hawaiian Islands	Feb. 3, 1909	Hawaii	Do.
East Park	Feb. 25, 1909	California	Do.
Cold Springs	do	Oregon	Do.
Shoshone	do	Wyoming	Do.
Pathfinder	do	do	Do.
Bellefourche	do	South Dakota	Do.
Strawberry Valley	do	Utah	Do.
Salt River	do	Arizona	Do.
Deer Flat	do	Idaho	Do.
Minidoka	do	do	Do.
Willow Creek	do	Montana	Do.
Carlsbad	do	New Mexico	Do.
Rio Grande	do	do	Do.
Keechelus Lake	do	Washington	Do.
Kachess Lake	do	do	Do.
Cle alum Lake	do	do	Do.
Bumping Lake	do	do	Do.
Conconully	do	do	Do.
Bering Sea	Feb. 27, 1909	Alaska	Do
Pribilof[1]	do	do	Do
Tuxedni	do	do	Do
Farallon	do	California	Do
Culebra	do	Porto Rico	Do
Yukon Delta	do	Alaska	Do
St. Lazaria	do	do	Do
Bogoslof	Mar. 2, 1909	do	Do
Clear Lake	Apr. 11, 1911	California	Do.
Forrester Island	Jan. 11, 1912	Alaska	Do.
Hazy Islands	do	do	Do.
Niobrara	do	Nebraska	[2] 14.64
Green Bay	Feb. 21, 1912	Wisconsin	1.87
Chamisso Island	Dec. 7, 1912	Alaska	Unknown.
Pishkun	Dec 17, 1912	Montana	Do.
Desecheo Island	Dec. 19, 1912	Porto Rico	Do.
Gravel Island	Jan. 9, 1913	Wisconsin	Do.
Aleutian Islands	Mar. 3, 1913	Alaska	Do.
Canal Zone[3]	Mar. 19, 1913	Panama	Do.
Walker Lake	Apr. 21, 1913	Arkansas	Do.
Petit Bois Islands	May 6, 1913	Alabama and Mississippi	Do.
Anaho Island	Sept. 4, 1913	Nevada	247.73
Smith Island	June 6, 1914	Washington	Unknown.
Dungeness Spit	Jan. 20, 1915	do	226.02
Ediz Hook	do	do	[2] 83.00
Mille Lacs	May 14, 1915	Minnesota	Unknown.
Big Lake	Aug. 6, 1915	Arkansas	Do.
San Francisco Bay	Aug. 9, 1916	California	141.00
North Platte	Aug. 21, 1916	Nebraska	Unknown.

[1] Transferred to Bureau of Fisheries.

[2] Approximate area.

[3] Under jurisdiction of Isthmian Canal Commission. Canal Zone, strictly speaking, not a bird reservation, but birds are protected by Executive order.

List of bird reserves—Continued.

Name of reservation.	Date.	Location.	Area.
BIRD RESERVES ENLARGED OR REDUCED.			
			Acres.
Pelican Island	Jan. 26, 1909	Florida (enlarged)	Unknown.
Mosquito Inlet	Apr. 2, 1909	....do	Do.
Cold Springs	Nov. 25, 1911	Oregon (enlarged)	Do.
Clear Lake	Jan. 13, 1912	California (reduced)	Do.
Minidoka	Feb. 21, 1912	Idaho (enlarged)	Do.
Niobrara	Nov. 14, 1912	Nebraska (enlarged)	[1] 15,253.7
Deer Flat	Apr. 21, 1915	Idaho (reduced)	Unknown.
Klamath Lake	May 14, 1915	Oregon and California (reduced)	Do.

[1] Transferred to Bureau of Fisheries.

Total reservations, excluding Canal Zone, 71.

Aggregate cash receipts from the disposal of public and Indian lands from May 20, 1785, to June 30, 1919.

Fiscal years.	Cash sales.	Amount of fees and commissions.	Total receipts from fees and disposal of public lands.	Receipts from sales of Indian lands.	Miscellaneous receipts.	Aggregate receipts from all sources.
						Acres.
May 20, 1785, to June 30, 1880						$208,059,657.14
1881	$3,534,550.98	$860,833.65	$4,395,384.63	$1,006,691.63	$6,727.90	5,408,804.16
1882	6,628,775.92	1,124,531.15	7,753,307.07	634,617.22	6,591.75	8,394,516.04
1883	9,657,032.28	1,423,329.10	11,080,361.38	625,404.27	8,118.05	11,713,883.70
1884	10,304,582.49	1,536,410.58	11,840,993.07	938,137.26	10,274.76	12,789,405.09
1885	6,223,926.74	1,462,188.06	7,686,114.80	933,483.52	8,821.86	8,628,420.18
1886	5,757,891.06	1,654,876.25	7,412,767.31	1,607,729.63	10,587.40	9,031,084.34
1887	9,246,321.33	1,537,600.39	10,783,921.72	1,484,302.30	20,784.85	12,289,008.87
1888	11,203,071.95	1,498,000.05	12,701,072.00	821,113.77	24,951.65	13,547,137.42
1889	8,018,254.50	1,251,971.23	9,270,225.73	389,524.72	26,150.89	9,685,901.34
1890	6,349,174.24	1,121,696.07	7,470,870.31	293,062.30	16,585.00	7,780,517.61
1891	4,160,099.07	944,938.65	5,105,037.72	318,333.42	5,849.00	5,429,220.14
1892	3,322,865.01	1,064,805.26	4,387,670.27	456,681.84	15,757.58	4,860,109.69
1893	3,193,280.64	998,184.65	4,191,465.29	284,752.65	3,516.20	4,479,734.14
1894	1,653,080.71	1,021,205.08	2,674,285.79	91,981.03	1,557.50	2,767,824.32
1895	1,116,090.07	750,710.59	1,866,800.66	149,879.48	16,773.89	2,033,454.03
1896	1,053,905.59	793,557.82	1,847,463.41	214,700.42	44,197.84	2,106,361.67
1897	917,911.19	678,469.55	1,596,380.74	438,716.31	52,834.23	2,087,931.28
1898	1,291,076.10	853,265.50	2,144,341.60	100,317.49	33,336.09	2,277,995.18
1899	1,703,988.32	890,702.17	2,594,690.49	442,913.73	32,533.12	3,070,137.34
1900	2,899,731.83	1,157,081.03	4,056,812.86	239,769.39	83,175.85	4,379,758.10
1901	2,966,542.86	1,340,894.29	4,307,437.15	585,661.27	79,062.37	4,972,160.79
1902	4,139,268.47	1,740,820.18	5,880,088.65	288,666.68	93,171.85	6,261,927.18
1903	8,960,471.18	1,597,147.48	10,557,618.66	308,939.14	158,185.85	11,024,743.65
1904	7,445,902.84	1,349,990.89	8,795,893.73	333,757.62	153,690.63	9,283,341.98
1905	4,849,766.06	1,286,621.93	6,136,387.88	791,807.67	89,615.72	7,017,811.38
1906	4,885,988.82	1,642,488.56	6,528,477.38	967,532.50	89,514.02	7,585,523.90
1907	7,728,114.30	1,819,159.21	9,547,273.51	1,892,805.70	113,098.79	11,553,178.00
1908	9,760,570.19	1,731,883.57	11,492,453.76	997,972.52	225,283.18	12,715,709.46
1909	7,698,337.03	1,536,890.67	9,235,227.70	2,334,885.47	330,136.61	12,216,415.39
1910	6,342,744.75	2,028,892.35	8,371,637.10	2,037,551.68	1,054,735.28	11,463,924.06
1911	5,783,693.39	1,461,514.30	7,195,187.69	2,822,600.71	[1]1,022,119.20	11,089,927.60
1912	5,437,502.07	1,234,216.47	6,671,718.54	2,284,538.37	[1]1,016,791.09	9,973,048.00
1913	2,746,546.52	1,540,994.15	4,287,540.67	2,118,469.34	[1]549,494.80	6,955,504.81
1914	2,650,761.84	1,654,085.02	4,304,846.86	1,844,802.77	47,677.90	6,148,367.63
1915	2,331,368.44	1,581,805.48	3,913,173.92	1,556,630.97	28,386.01	5,394,948.20
1916	1,769,860.33	1,660,933.33	3,430,793.66	1,972,299.49	41,468.44	5,444,561.59
1917	1,935,954.53	1,641,860.14	3,577,814.67	[2]2,445,582.52	[3]126,233.35	6,149,630.54
1918	2,050,575.58	1,160,350.88	3,210,926.46	1,935,773.73	285,127.47	5,431,827.66
1919	1,464,718.99	1,194,472.10	2,659,191.09	1,387,781.74	256,701.33	4,303,674.16
Total						495,733,776.33

[1] Includes reclamation water-right charges.
[2] Includes $152.88 originally erroneously reported as Indian sale.
[3] Does not include $152.88 mentioned in footnote 2.
Reclamation water-right charges under act of Aug. 9, 1912 (37 Stat., 265) were collected from Jan. 1, 1913, by the Reclamation Service.

Amounts accrued and paid to States for purposes of education, or of making public roads and improvements on account of grants 2, 3, and 5 per cent of net proceeds of sales of public lands lying within said States.

State.	Total to June 30, 1917.	Fiscal year 1918.	Aggregate to June 30, 1918, inclusive.
Alabama	$1,079,413.08	$313.69	$1,079,726.77
Arizona	19,776.02	2,067.31	21,843.33
Arkansas	327,512.66	480.05	327,992.71
California	1,134,743.14	4,500.43	1,139,243.57
Colorado	495,458.87	5,390.23	500,849.10
Florida	143,335.40	219.80	143,555.20
Idaho	275,703.78	5,735.33	281,439.11
Illinois	1,187,908.89	.....	1,187,908.89
Indiana	1,040,255.26	.....	1,040,255.26
Iowa	633,638.10	.....	633,638.10
Kansas	1,127,804.99	127.90	1,127,932.89
Louisiana	468,831.88	.....	468,831.88
Michigan	588,008.09	184.94	588,193.03
Minnesota	592,656.55	233.48	592,890.03
Mississippi	1,070,469.96	374.00	1,070,843.96
Missouri	1,061,043.86	23.03	1,061,066.89
Montana	517,055.95	22,010.52	539,066.47
Nebraska	568,703.00	2,521.21	571,224.21
Nevada	40,108.60	1,452.74	41,561.34
New Mexico	137,800.58	1,496.98	139,297.56
North Dakota	537,845.91	275.90	538,121.81
Ohio	999,353.01	.....	999,353.01
Oklahoma	64,176.60	755.35	64,931.95
Oregon	744,719.31	4,152.35	748,871.66
South Dakota	340,993.54	1,490.51	342,484.05
Utah	107,690.75	13,668.46	121,359.21
Washington	424,427.08	1,750.83	426,177.96
Wisconsin	586,628.67	16.59	586,645.21
Wyoming	252,931.00	15,831.84	268,762.84
Total	16,568,994.53	85,073.47	16,654,068.00

Amounts covered into the Treasury to the credit of the reclamation fund from the sales of public lands and fees and commissions in the several States, under the act of June 17, 1902 (32 Stat., 388).

State.	Fiscal years.		Total for 18 years ended June 30, 1918.
	1901 to 1917.	1918	
Arizona	$1,513,741.32	$67,860.18	$1,581,601.50
California	6,336,251.92	125,376.26	6,461,628.18
Colorado	8,131,286.23	266,540.12	8,397,826.35
Idaho	5,857,095.01	171,600.59	6,028,695.60
Kansas	1,013,569.06	7,182.28	1,020,751.34
Montana	12,172,775.79	766,945.29	12,939,721.08
Nebraska	1,910,397.96	64,133.73	1,974,531.69
Nevada	682,562.78	36,044.09	718,606.87
New Mexico	4,660,945.40	114,235.86	4,775,181.26
North Dakota	12,123,898.31	20,399.07	12,144,297.38
Oklahoma	5,864,788.60	16,746.33	5,881,534.93
Oregon	10,946,334.23	113,128.72	11,059,462.95
South Dakota	7,378,424.43	45,863.63	7,424,288.06
Utah	2,245,663.31	291,931.52	2,537,594.83
Washington	7,005,363.10	48,529.41	7,053,892.51
Wyoming	5,238,309.03	384,493.84	5,622,802.87
Total	93,081,406.48	2,541,010.92	95,622,417.40

State grants, fiscal year ended June 30, 1919.

Kind of selection.	Pending and received.			Disposed of.			Pending June 30, 1919.
	Pending July 1, 1918.	Since received.	Total.	Approved.	Canceled.	Total.	
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Swamp	133,734.20	1,829.34	135,563.54	7,963.79	23,960.74	31,924.53	103,639.01
School indemnity	4,038,584.41	472,090.33	4,510,674.74	1,277,909.11	32,971.48	1,310,880.59	3,199,794.15
University	16,766.52	47,820.96	64,587.48	19,229.53	320.00	19,549.53	45,037.95
Agricultural and mechanical colleges	37,254.61	529.02	37,783.63	11,498.26	.....	11,498.26	26,285.37
Penitentiaries	3,547.35	6,109.12	9,656.47	235.16	.....	235.16	9,421.31
Public buildings	22,530.05	440.00	22,970.05	2,198.71	1,439.60	3,638.31	19,331.74
Insane asylums	10,078.67	.....	10,078.67	1,760.00	.....	1,760.00	8,318.67
Educational, charitable, penal, and reformatory institutions	13,685.03	.....	13,685.03	200.00	.....	200.00	13,485.03
Deaf, dumb, and blind asylums	6,847.19	.....	6,847.19	4,370.28	.....	4,370.28	2,476.91
Normal schools	74,908.50	12,027.75	86,936.25	30,900.36	156.84	31,057.20	55,879.05
School of mines	10,919.54	12,228.37	23,147.91	9,534.01	.....	9,534.01	13,613.90
Reservoirs	873.58	607.58	1,481.16	1,481.16	.....	1,481.16	.....
Miners' hospitals	6,455.44	80.00	6,535.44	394.40	.....	394.40	6,141.04
Military institutes	77,059.32	956.00	78,015.32	31,591.86	240.00	31,831.86	46,183.46
Bonds issued by Santa Fe and Grant Counties	57,012.68	560.00	57,572.68	7,541.25	79.43	7,620.68	49,952.00
Bonds issued by Maricopa, Pima, etc., Counties	418,812.63	5,154.33	423,966.96	229,990.48	4,558.50	234,548.98	189,417.98
Reform school	.....	141.06	141.06	.....	.....	.....	141.06
Public park	1,272.50	.....	1,272.50	.....	.....	.....	1,272.50
Internal improvements	.....	425.85	425.85	.....	425.85	425.85	.....
Total specific grants	758,023.61	87,080.04	845,103.65	350,925.46	7,220.22	358,145.68	486,957.97
Grand total	4,930,342.22	560,999.71	5,491,341.93	1,636,798.36	64,152.44	1,700,950.80	3,790,391.13

State grants—Recapitulation.

State.	Swamp confirmed.	School indemnity confirmed.	Other grants confirmed.
Alabama	113.39	.....	.....
Arizona	.....	451,238.87	303,768.60
California	2,019.43	57,169.42	.....
Colorado	.....	28,701.41	.....
Florida	.....	200.81	.....
Idaho	.....	44,226.18	235.16
Iowa	40.00	.....	.....
Louisiana	4,802.93	159.52	.....
Michigan	40.00	.....	.....
Minnesota	40.00	.....	.....
Mississippi	886.44	.....	.....
Montana	.....	255,658.02	100.00
New Mexico	.....	351,609.23	44,686.14
North Dakota	.....	3,611.75	.....
Oregon	.....	80.00	.....
South Dakota	.....	63,981.99	.....
Utah	.....	15,522.18	1,481.16
Wisconsin	21.60	.....	.....
Wyoming	.....	5,749.73	594.40
Total	7,963.79	1,277,909.11	350,925.46

Withdrawals under the act of Mar. 15, 1910 (36 Stat., 237), from the passage of the act to June 30, 1919.

State.	Applied for.	Rejected before withdrawal.	Withdrawn.	Restored.	Remaining withdrawn.
Arizona	33,270.76		33,270.76	15,030.76	18,240.00
Colorado	1,044,846.19	354,276.73	676,318.29	646,610.14	29,708.15
Idaho	629,501.61	262,091.03	346,245.81	325,081.04	21,164.77
Montana	118,064.07	77,056.57	41,007.50	41,007.50	
Nevada	11,160,074.59	481,023.22	679,051.37	679,051.37	
New Mexico	383,951.62	368,090.02	15,861.60	15,861.60	
Oregon	446,470.13	208,607.30	236,952.92	161,455.28	75,497.64
Utah	697,917.28	334,607.97	363,309.31	363,309.31	
Wyoming	365,202.64	211,768.02	150,634.62	129,780.19	20,854.43
Total	4,879,298.89	2,297,520.86	2,542,652.18	2,377,187.19	165,464.99

State desert-land segregations under section 4 of the act of Aug. 18, 1894 (28 Stat., 372–422), and the acts amendatory thereof, commonly designated as the Carey Act, with the action taken thereon, from the passage of the act to June 30, 1919.

State.	Applied for.	Rejected before segregation.	Segregated.	Canceled.	Patented.	Reconveyed.	Time to reclaim extended.
Arizona	13,905.16	2,991.81					
Colorado	460,431.06	131,161.14	284,653.97	89,042.51	13,302.46		
Idaho	3,251,270.48	1,909,943.64	1,321,454.92	314,346.22	551,028.58		
Montana	609,826.46	346,938.70	228,973.84	79,876.81	66,266.33	10,104.03	62,584.95
Nevada	185,445.85	143,197.26	36,808.59	24,562.57			
New Mexico	10,164.68	2,600.00	7,564.68				
Oregon	791,615.27	309,109.90	387,078.30	105,702.36	62,718.34	6,014.49	140,740.90
Utah	606,704.00	281,355.33	141,814.94	56,145.70	25,814.65		
Washington	155,649.39	155,649.39					
Wyoming	1,712,618.44	265,296.43	1,350,615.53	265,280.29	164,135.15	4,457.23	232,709.51
Total	7,797,630.79	3,548,243.60	3,758,964.77	934,956.46	883,265.51	20,575.75	436,035.36

Alleged fraudulent entries acted upon during 1918–19.

	Pending 1918.	Received.	Approved.	Canceled.	Otherwise disposed of.	Total.	Pending 1919.	Hearings ordered.
Homesteads:								
Originals	7,977	8,811		379	7,388	7,767	9,021	338
Finals	473	2,776	2,497	5	555	3,057	192	33
Cash	22	219	138	3	87	228	13	3
Desert land:								
Originals	740	1,236		5	1,566	1,571	405	
Finals	137	63	1	3	98	102	98	
Timber culture:								
Originals	4						4	
Finals	2						2	
Timber and stone:								
Originals	664	232		21	105	126	770	29
Finals	43	46	18	1	19	38	51	11
Isolated tracts:								
Originals	156	35			23	23	168	1
Cash	101	22	5		42	47	76	
Mineral:								
Applications	489	95			123	123	461	12
Entry	68	98			124	124	42	7
Soldiers' additional	446	369	270	77		347	468	
Selections:								
State	1,745	716			794	794	1,667	15
Forest	161	61			57	57	165	3
Railroad	365	36			24	24	377	15
Indian allotment	503	540			433	433	610	
Squatter claims	48						48	
Mineral locations	84	23			7	7	100	1
Total	14,228	15,378	2,929	494	11,445	14,868	14,738	468

Indictments, convictions, acquittals and dismissals, fines imposed, paid, and prison sentences, June 30, 1918, to June 30, 1919.

Offenses.	Indictments.	Convictions.	Prison sentences.	Fines imposed.	Fines paid.	Acquittals and dismissals.
Timber trespass	4	1		$10		1
Conspiracy	6	5		450		1
Perjury	6	3	3	1,150	$1,000	5
Section 215, Penal Code	2	1	1			
Forgery	4	1	1			1
Mislocating entrymen	4	2		400		
Subornation of perjury	2					1
Preventing bids on public sales	1					
Fraudulent locations	1					
Falsifying accounts		1	1	300		
Section 37, Penal Code						8
Filing forged relinquishment						1
Filing false papers						1
Procuring false affidavits						1
Total	39	14	6	2,310	1,000	20

Class, number, and area of patents issued during fiscal year ended June 30, 1919.

Class.	No.	Area.	Class.	No.	Area.
		Acres.			*Acres.*
Commuted homestead	2,844	375,406.38	Private land claim	38	33,589.59
Timber and stone	488	47,518.93	Small holding claim	3	53.07
Public sale	2,463	198,048.08	Swamp	22	7,963.79
Cash, miscellaneous	438	42,896.415	Umatilla Indian land	45	5,229.86
Desert land	1,675	267,065.22	Abandoned military reservation	38	6,765.98
Desert-land reclamation	4	240.00	Choctaw lands	10	3,391.54
Desert-land segregation	14	76,809.80	Chickasaw lands	1	640.84
Town site	5	228.779	Agricultural college scrip	1	[2]
Town lot	1,143	293.48	Porterfield scrip	4	160.00
Homestead	34,457	8,312,318.888	Sioux half-breed scrip	1	40.00
Forest homestead	1,020	122,430.58	Valentine scrip	1	.32
Indian homestead	8	680.00	Cemetery site	4	160.00
Reclamation homestead	469	33,233.88	Villa site	199	797.07
Soldier's additional homestead	284	13,334.12	Railroad	30	632,284.40
Stock-raising homestead	21	4,938.00	Indian	6,107	395,549.95
Forest lieu selection	35	6,958.26	Special acts	987	148,416.791
Military bounty land warrant	46	1,995.07	Supplemental patents Apr. 14, 1914	2,054	[3]
Mineral	462	32,691.516	Total	55,490	10,777,001.349
Coal	44	4,870.75			
Coal deposit	25	[1]			

[1] Surface area reported elsewhere, 1,708.93 acres.
[2] Incomplete record.
[3] Area of supplemental patents act Apr. 14, 1914, 328,081.275 acres.

	Acres.
Patented area under enlarged homestead act	6,745,261.74
Patented area under Kinkaid Act	282,867.50
Patented area coal reserved	1,109,392.315
Patented area act July 17, 1914 (phosphate, etc.)	153,012.34
All included in the above report.	
Area of Indian fee patents not included in above report	410,529.79

Consolidated work report for fiscal year 1919, by months

	Months	Pending July 1, 1918			Received			Approved		Disposed of					Pending June 30, 1919.		
		For office action	For action elsewhere.	Total.	From outside office	By reference from other divisions	Total pending at beginning of period and received during period	Patent	Other	Canceled	Patented	Otherwise	Referred to other divisions	Total	For office action.	For action elsewhere	Total.
Cases of all kinds	1918 July	54,447	1,482	93,929	11,300	44,113		2,038	1,942	671	3,243	6,429	37,093	52,056			
	August				11,740	34,666		3,116	1,858	564	4,548	6,367	30,951	47,424			
	September				10,351	36,052		2,780	1,536	538	2,501	8,340	25,026	40,720			
	October				10,087	40,975		3,309	2,144	992	2,938	8,342	32,670	50,271			
	November				10,136	35,853		3,656	2,226	529	2,787	6,651	28,011	44,810			
	December				9,079	30,439		3,731	2,102	435	2,083	9,130	23,529	41,830			
	1919 January				10,061	44,399		3,832	3,336	521	6,139	8,208	34,823	54,041			
	February				9,968	36,768		4,117	2,535	561	4,625	6,535	27,545	43,038			
	March				10,650	42,907		4,213	3,875	536	4,285	7,931	33,006	54,168			
	April				11,521	38,602		4,130	4,366	571	9,571	7,690	29,187	47,526			
	May				11,190	42,367		5,711	4,609	812	10,611	7,530	28,674	52,159			
	June				12,605	66,624		11,090	1,398	608	14,035	13,112	32,468	72,913	67,456	40,971	108,427
Total		54,447	1,482	93,929	128,648	492,015	714,592	52,362	31,987	7,788	55,490	95,603	362,922	606,165	67,456	40,971	108,427
								SELECTIONS—AREA IN ACRES									
Railroad and wagon roads	1918 July	343,790 86	5.47	1,693,712 33	574 50	17,072 42		88,246 81					571 50	92,721 04			
	August				246,488 27	2,903 24							19,400 04	19,748 00			
	September				30,186 12	6,511 17		156,027 86					225,564 51	411,951 31			
	October				19,011 90	283,895 05		3,881 33					27,053 77	27,566 75			
	November				2,441 32	28,213 54							884 55	6,744 19			
	December				3,072 00	14,209 54							4,523 77	4,653 77			
	1919 January				9,583 37	23,739 47		1,020 51					9,701 57	11,265 69			
	February				9,259 45	166 58		43,181 84					9,179 45	52,561 87			
	March				82,414 53	19,634 05		332,560 07					82,904 53	416,001 13			
	April				20,975 20	937 29		5,773 26					28,714 70	28,714 70			
	May				63,478 20			979 81					2,935 20	64,260 69			
	June				25,451 17	132,561 88							61,861 54	64,260 69			
Total		343,790 86	5.47	1,693,712 33	513,449 32	529,900 03	2,737,048.68	631,742 09					26,367 48	30,433 94	362,909 01	1,207,423 60	1,570,422 61
State	1918 July	2,248,619 03	44.76	5,284,663 79	38,426 94	183,083 20		129,185 20					514,334 41	1,166,626 07	362,909 01	1,207,423 60	1,570,422 61
	August				94,350 13	160,092 55		161,073 32					169,311 40	290,401 99			
	September				12,183 82	479,705 88		34,848 23					275,296 67	439,142 26			
	October				69,467 71	322,164 06		67,221 83					249,875 70	325,043 60			
	November				7,089 69	29,303 83		86,335 99					267,895 04	348,886 87			
	December				20,669 08	130,166 65		57,742 36					90,981 11	173,246 66			
	1919 January				7,156 80	50,702 45		170,706 33					75,855 48	136,899 02			
	February				136,754 45	80,453 72		134,735 40					22,643 93	195,706 59			
	March				12,632 78	165,212 41		326,504 00				180,000 00	147,679 29	269,981 85			
	April				10,976 06	71,629 89		141,245 24					39,134 13	552,212 14			
	May				39,491 60	68,752 25		180,388 92					77,990 70	222,333 83			
	June				54,948.17	72,863 34		171,528 15					101,512 65	285,782 07			
Total		2,248,619 03	44.76	5,284,663.79	502,398.13	1,855,640 26	7,642,702.18	1,632,514 97				180,000 00	92,338 32	264,503 31	1,937,435 69	2,212,185 40	4,149,621 09
Miscellaneous	1918 July	112,304 01	17.27	1,897,721 28	5,132.65			25,311 16					1,640,374 42	3,443,091 09	1,937,435 69	2,212,185 40	4,149,621 09
	August							1,979 01					2,880 00	33,192 80			
	September				83,299.99			6,621 19					4,539 17	15,417 18			
	October					560 00		7,682 11					2,940 00	10,332 63			
	November				33,133.69	1,320 00		74 00					800 00	22,760 72			
	December							4,848 66					7,419 69	23,306 42			
	1919 January				251,936.51			36,323 31					1,480 00	46,314 39			
	February				21,394 77			14,057 26					160 00	38,898 48			
	March				28,728 13	200 00		17,500 97					1,320 00	17,888 47			
	April				42,014.91	1,586 34		473 72					3,520 00	27,869 61			
	May					2,280 00						187,128 36	1,500 00	191,318 44			
	June				146,105.84	640 00		8,607 18					3,400 00	3,480 00			
Total		112,304.01	17.27	1,897,721.28	611,556.40	6,589 34	2,515,847 02	123,547 17					115 09	10,723 17	190 271 19	1,884,694 22	2,074,965 41
Carey Act segregations	1918 July	616,032 61	48.50	1,014 881 11									30,557 86	440,901 61	190,271.19	1,884,694 22	2,074,965 41
	August											12,070 06	12,070 06				
	September							3,536 15					695 21	4,131 38			
	October												26,915 26	26,915 26			
	November																
	December																
	1919 January																
	February												457,683 18	457,683 18			
	March												10,546 10	10,546 10			
	April																
	May												160 00	160 00			
	June																
Total		616,032 61	48.50	1,014,881.11			1,014,881 11	3,536 15				12,070 06	495,899 75	511,505 96	31,271 87	472,103 28	503,375 15
Aggregate		3,320,752 51	6,570,22	9,890,978 51	1,627,390 85	2,392,129 03	13,910,498 99	2,391,340 08				379 198 42	2,185,266 69	5,612 114 73	2,521,077 76	5,776,406 50	8,298 384 62

Consolidated work report for fiscal year 1919, by divisions

	Divisions	Pending July 1, 1918			Received		Total pending at beginning of year and received during year.	Approved		Disposed of					Pending June 30, 1919.		
		For office action	For action elsewhere	Total.	From outside divisions	By reference from other divisions.		Patent	Other	Canceled	Patented.	Otherwise	Referred to other divisions	Total.	For office action.	For action elsewhere	Total
Cases of all kinds	B	5,577		5,577		59,693	65,270				55,490		1,676	57,166	8,104		8,104
	C	20,456	10	31,041		57,085	88,040	40,131		3,050		24,619	3,058	70,858	4,291	13,897	17,188
	D	1,902		1,902		86,265	88,167						86,845	86,845	1,322		1,322
	F	208	646	854	2,403		3,257		2,473	2			2,475		737	145	882
	G	2,243	6	9,061	5,594	6,052	20,617	2,339		1,193		6,328	580	10,430	2,568	7,619	10,187
	H	251	818	1,069		707	1,776	28		81		208	405	812	177	787	964
	K	679	734	1,413	2,312	2,386	6,111	56		1,745		3,212	148	5,161	439	511	950
	E	6,679	1,837	15,222	4,883	3,528	23,633	5,600		700		7,481	829	14,622	4,112	4,899	9,011
	L	6		6		47,886	47,892					47,886		47,886	6		6
	M	2,312	340	2,652	109,598	424	112,674		5,164			740	103,272	109,176	3,573	225	3,798
	N	963	818	1,781	1,640	447	3,918	745		455		1,168	212	2,580	217	1,121	1,338
	O	9,710		9,710		213,523	223,233		24,350				158,141	182,491	40,742		40,742
	FS	3,071	10,470	13,541	1,837	14,215	29,593	3,457		566		3,931	7,704	15,658	2,108	11,767	13,935
Total		54,447	32,482	93,929	128,477	492,181	714,587	52,362	31,987	7,788	55,490	95,603	302,570	606,160	67,456	40,971	108,427
								SELECTIONS—AREAS IN ACRES									
Railroad and wagon roads	G	343,790 86	1,349,91 47	1,693,712.33		529,900.03	2,223,612 36	631,742.09		20,549.57			1,538.44	653 830.10	362,358 60	1,207,423.60	1,569,782.26
	M				513,436.32		513,436 32						512,795 97	512 795 97	640 35		640 35
Total		343,790 86	1,349 91 47	1,693 712 33	513,436 32	529,900 03	2,737,048.68	631 742.09		20,549.57			514,334.41	1 166,626 07	362,909.01	1,207,423 60	1 570 422 61
State	G	2,216,598 40	1,829 48	4,046,049 42		1,512,052.12	5,558,101 54	1,628,831.57		40,191.70		180,000.00	420 898 02	2,269 921.29	1,856,065.97	1,432,111.28	3,288 177 25
	M	120 21		120 21	502,398.13		502 518 34						480 000 37	480 000 37	38 517.97		38 517 97
	FS	31,900 36	1,206,59 99	1,238,494 35		343,588.14	1,582,082.30						729 491.43	729 491.43	72 516.75	780,074.12	852 590 87
Total		2,248,619 03	3,036,049	5,284 663.79	502 398.13	1,855,640.26	7,642 702.18	1 628 831.57		40,191 70		180 000.00	1,641 034 82	3,493,081 09	1,937 435.69	2,212,185.40	4,149 621 09
Miscellaneous	F	50,260 06	1,060,62 20	1 110 88 26	611,316.40		1,722 181 66	115 508.78		75,467.48		187,128.36	2 900.00	381 004.62	157 845 18	1,183,331.80	1,341 1.7.04
	G	56,852 80	74 72 19	131 580 99		1,829 34	133,400 63	8,038.39		23,960.74				31,999.13	25,351 31	76,059 19	101 410.50
	H	4 569 45	35 64	43 212 51		4,240.00	47 452 51			240.00			22,400 00	22,640.00	6,960.00	18,252.51	24 812.51
	FS	638.70	611.42	612 063 22		760.00	612 823 22						5,257.86	5,257 86	514.70	607,050.66	607,565.36
Total		112 304 01	1 785.41	1 897 721 28	611,316 40	6,829.34	2,515 867 02	123,547.17		99,668.22		187 128.36	30,557.86	440 901 61	190,271.19	1,884,694.22	2,074,965.41
Carey Act segregation applications	F	616,032 61	398,84 50	1 014 881 11			1,014,881 11	3 536 15		495,899.75		12,070.06		511,505 96	31,271.87	472 103.28	503,375.15
Aggregate		3 320,752 51	6 570,22 00	9 890,978 51	1,627,390 85	2,392,369 63	13 910,498 99	2,387,650 08		656 309.24		379 198.42	2,188 947 00	5 612 114.73	2,521,077.76	5,776,406.50	8,298,384.26

Area by office of entries patented during the fiscal year ended June 30, 1919.

State.	Office.	Area.
		Acres.
Alabama	Cahaba	80.000
	Lebanon	160.000
	Montgomery	38,137.680
	St. Stephens	640.200
Alaska	Fairbanks	1,535.393
	Juneau	4,134.679
	Nome	1,929.462
Arizona	Phoenix	152,997.532
		8,650.950
Arkansas	Camden	20,812.600
	Harrison	51,673.920
	Little Rock	53,290.820
	Washington	2,944.630
California	El Centro	12,727.797
	Eureka	9,001.220
	Independence	18,583.239
	Los Angeles	84,518.500
	Sacramento	68,470.712
	San Francisco	72,976.190
	Susanville	34,920.225
	Visalia	32,736.951
		1,943.810
Colorado	Del Norte	11,240.826
	Denver	187,012.859
	Durango	29,731.118
	Glenwood Springs	62,552.120
	Hugo	66,636.310
	Lamar	385,061.890
	Leadville	6,908.587
	Montrose	45,174.583
	Pueblo	248,495.735
	Sterling	293,231.450
Florida	Gainesville	63,801.450
Idaho	Blackfoot	331,418.286
	Boise	131,056.103
	Coeur d'Alene	19,809.657
	Hailey	245,799.150
	Lewiston	56,856.492
Illinois	General Land Office.	326.120
	Shawneetown	159.500
Indiana	General Land Office.	1,480.000
	Vincennes	80.000
Iowa	Des Moines	40.000
	Dubuque	6.818
	General Land Office.	230.450
Kansas	Dodge City	40,018.830
	Garden City	120.000
	Lecompton	120.000
	Topeka	11,469.270
Louisiana	Baton Rouge	33,521.350
	Greenburg	120.880
	Monroe	221.020
	New Orleans	559.820
	Ouachita	610.580
	Opelousas	782.000
Michigan	Marquette	8,905.800
Minnesota	Cass Lake	109,006.100
	Crookston	145,899.620
	Duluth	14,252.550
		3,653.410
Mississippi	Augusta	719.720
	Jackson	17,640.130
	Pontotoc	1,437.750
	Washington	194.680
		4,032.380
Missouri	Springfield	3,026.715
Montana	Billings	216,050.079
	Bozeman	127,534.611
	Glasgow	701,131.484
Montana	Great Falls	326,589.590
	Havre	669,966.269
	Helena	134,551.489
	Kalispell	11,168.293
	Lewistown	489,365.933
	Miles City	619,188.121
	Missoula	32,855.401
		117,934.820
Nebraska	Alliance	93,930.100
	Broken Bow	122,592.580
	Lincoln	1,767.750
	North Platte	36,300.260
	O'Neill	9,778.920
	Valentine	66,741.020
Nevada	Carson City	212,457.774
	Elko	53,505.034
		10.000
New Mexico	Clayton	183,558.890
	Fort Sumner	56,632.080
	Las Cruces	67,523.489
	Roswell	142,387.478
	Santa Fe	451,873.220
	Tucumcari	117,922.120
		203,793.230
North Dakota	Bismarck	24,068.260
	Devils Lake	1,800.000
	Dickinson	102,623.310
	Minot	75,347.605
	Williston	102,790.240
		11,859.010
Ohio	General Land Office.	158.650
Oklahoma	Guthrie	58,930.534
	Lawton	160.000
		80.000
Oregon	Burns	70,925.420
	LaGrande	109,540.410
	Lakeview	87,575.290
	Portland	13,205.269
	Roseburg	33,223.224
	The Dalles	117,778.520
	Vale	51,167.050
		777.410
South Dakota	Bellefourche	74,545.021
	Gregory	32,290.997
	Lemmon	96,317.420
	Pierre	23,138.720
	Rapid City	85,177.819
	Timber Lake	100,583.625
		43,706.450
Utah	Salt Lake City	151,342.971
	Vernal	22,188.750
		602.050
Washington	Seattle	29,786.144
	Spokane	44,772.515
	Vancouver	12,200.280
	Walla Walla	31,717.390
	Waterville	60,735.205
	Yakima	33,813.710
		2,281.800
Wisconsin	Mineral Point	240.000
	Wausau	7,772.830
		160.000
Wyoming	Buffalo	57,240.760
	Cheyenne	197,239.058
	Douglas	66,788.832
	Evanston	49,522.040
	Lander	31,541.486
	Sundance	135,786.620
		100.000
Total		10,777,001.349

Consolidated work report of local land offices, fiscal year 1919.

Offices.	Cases pending and received.			Cases disposed of.				Pending June 30, 1919.
	Pending July 1, 1918.	Received.	Total.	Transmitted on appeal.	Transmitted otherwise.	Referred to chief of field division.	Total.	
Alabama:								
Montgomery	27	500	527	92	350	.....	442	85
Alaska:								
Fairbanks	16	315	331	.....	92	229	321	10
Juneau	97	827	924	.....	772	66	838	86
Nome [1]	.....	.....	.....	.....	.....	.....	.....	.....
Arizona:								
Phoenix	1,596	4,609	6,205	279	3,548	173	4,000	2,205
Arkansas:								
Camden	19	413	432	3	391	16	410	22
Harrison	58	2,008	2,066	4	1,956	14	1,974	92
Little Rock	61	1,648	1,709	44	1,552	43	1,639	70
California:								
El Centro	42	675	717	8	562	85	655	62
Eureka	155	225	380	86	125	11	222	158
Independence	152	750	902	6	646	29	681	221
Los Angeles	318	1,949	2,267	155	1,722	139	2,016	251
Sacramento	763	1,140	1,903	5	1,142	64	1,211	692
San Francisco	870	1,298	2,168	39	1,426	92	1,557	611
Susanville	369	622	991	.....	599	47	646	345
Visalia	507	824	1,331	.....	703	34	737	594
Colorado:								
Del Norte	331	301	632	14	434	18	466	166
Denver	630	1,648	2,278	10	1,603	100	1,713	565
Durango	469	712	1,181	4	759	33	796	385
Glenwood Springs	1,930	2,227	4,157	94	1,884	68	2,046	2,111
Hugo	58	351	409	1	339	8	348	61
Lamar	646	4,056	4,702	53	4,186	86	4,325	377
Leadville	331	555	886	.....	488	14	502	384
Montrose	712	1,570	2,282	.....	1,473	70	1,543	739
Pueblo	2,953	4,829	7,782	42	4,906	62	5,010	2,772
Sterling	558	1,964	2,522	18	2,240	22	2,280	242
Florida:								
Gainesville	40	881	921	14	831	48	893	28
Idaho:								
Blackfoot	1,762	4,129	5,891	41	3,183	153	3,377	2,514
Boise	1,360	2,132	3,492	32	2,193	83	2,308	1,184
Coeur d'Alene	36	343	379	11	330	8	349	30
Hailey	1,116	2,182	3,298	40	2,074	147	2,261	1,037
Lewiston	233	517	750	13	612	19	644	106
Kansas:								
Dodge City	132	503	635	4	584	4	592	43
Topeka	65	123	188	.....	127	3	130	58
Louisiana:								
Baton Rouge	37	513	550	17	485	19	521	29
Michigan:								
Marquette	13	297	310	.....	295	13	308	2
Minnesota:								
Cass Lake	100	1,808	1,908	34	958	11	1,003	905
Crookston	70	1,346	1,416	3	1,068	21	1,092	324
Duluth	27	440	467	3	423	14	440	27
Mississippi:								
Jackson	14	484	498	12	432	40	484	14
Missouri:								
Springfield	.....	66	66	.....	58	3	61	5
Montana:								
Billings	156	1,447	1,603	.....	1,359	12	1,371	232
Bozeman	610	1,260	1,870	8	1,209	38	1,255	615
Glasgow	1,841	4,429	6,270	172	4,200	91	4,463	1,807
Great Falls	4,853	2,943	7,796	109	6,836	64	7,009	787
Havre	1,273	4,414	5,687	267	3,865	77	4,209	1,478
Helena	1,194	2,423	3,617	31	2,092	119	2,242	1,375
Kalispell	32	596	628	4	587	2	593	35
Lewistown	1,580	325	1,905	1	265	11	277	1,628
Miles City	3,864	5,575	9,439	35	5,595	148	5,778	3,661
Missoula	63	908	971	44	703	33	780	191
Nebraska:								
Alliance	21	489	510	.....	416	40	456	54
Broken Bow	35	668	703	2	563	72	637	66
Lincoln	.....	125	125	1	102	12	115	10
North Platte [2]	11	155	166	.....	147	4	151	15
O'Neill [2]	5	50	55	1	42	7	50	5
Valentine [2]	91	249	340	47	235	16	298	42

[1] Reports not received.
[2] Offices discontinued Dec. 31, 1918, and pending cases are for that date.

Consolidated work report of local land offices, fiscal year 1919—Continued

Office	Cases pending and reserved			Cases disposed of				Pending June 30, 1919
	Pending July 1, 1918	Received	Total	Transmitted on appeal	Transmitted otherwise	Referred to chief of field division	Total	
Nevada								
Carson City	170	816	986	93	579	67	741	245
Elko	156	396	552	1	372	80	492	124
New Mexico								
Clayton	884	1,964	2,848	34	2,227	79	2,440	478
Fort Sumner	1,115	887	2,002	17	1,652	12	1,681	341
Las Cruces	1,180	1,773	2,953	73	1,859	21	1,953	1,000
Roswell	1,241	2,724	3,965	98	4,117	21	4,236	1,729
Santa Fe	2,886	2,238	5,124	12	3,096	15	4,123	2,001
Tucumcari	724	814	1,538	34	1,224	29	1,287	251
North Dakota								
Bismarck	116	15	131	5	364	5	374	97
Dickinson	411	692	1,103	19	897	8	931	172
Minot	116	279	395	4	798	6	808	87
Williston	141	582	723	6	643	3	672	101
Oklahoma								
Guthrie	112	1,290	1,402	87	1,185		1,272	130
Oregon								
Burns	709	885	1,594	9	679	28	696	592
Lakeview	1,256	1,191	2,447	7	1,283	100	1,390	1,057
Lakeview	265	647	877	24	591	29	644	233
Portland	397	1,483	1,880	39	1,586	1	1,626	161
Roseburg	133	681	814	15	665	1	681	133
The Dalles	1,141	1,804	3,445	47	1,708	101	1,856	1,589
Vale	1,054	838	1,892	1	921	72	994	898
South Dakota								
Aberdeen	1,143	958	2,101	15	1,128	33	1,176	1,025
Gregory	112	89	201	6	146		152	49
Huron	629	1,144	1,773	11	1,162	25	1,198	575
Lemmon	436	959	1,395	2	645	179	826	569
Rapid City	2,951	1,820	4,771	11	1,884	45	2,040	2,731
Upper Lakes	2	5	7	1	826		827	540
Utah								
Salt Lake City	1,821	2,316	4,137	5	2,224	110	2,339	1,819
Vernal	178	40	218		40	5	419	68
Washington								
Seattle	41	181	305	1	103		104	1
Spokane	124	68	191	3	765	20	790	141
Vancouver	29	363	392	1	153	4	158	85
Walla Walla	181	421	602	36	418	24	408	194
Wenatchee	81	885	1,869	26	991	47	1,064	805
Yakima	294	93	387	1	264	6	271	111
West Virginia								
Wheeling	1	184	189	1	179		184	11
Wisconsin								
Bayfield	1,870	2,788	4,658	22	2,601	19	2,672	1,986
Eau Claire	1,818	4,306	6,124	5	1,647	50	1,791	1,320
Dodgeville	2,838	4,144	6,982	16	4,262	161	4,579	2,403
Hayward	231	923	1,167	12	802	8	882	285
Ladysmith	20	1,461	1,481	17	1,267	30	1,314	167
Stevens Point	2,359	1,840	6,359	164	4,021	174	4,364	2,195
Grand total	68,443	128,604	197,407	2,944	129,917	4,226	137,084	59,723

Consolidated work report of local land offices, fiscal year 1919—Continued.

Offices.	Cases pending and received.			Cases disposed of.				Pending June 30, 1919.
	Pending July 1, 1918.	Received.	Total.	Transmitted on appeal.	Transmitted otherwise.	Referred to chief of field division.	Total.	
Nevada:								
Carson City	150	836	986	95	579	67	741	245
Elko	130	396	526	.....	372	30	402	124
New Mexico:								
Clayton	881	1,937	2,818	34	2,227	79	2,340	478
Fort Sumner	1,145	887	2,032	17	1,662	12	1,691	341
Las Cruces	1,599	1,354	2,953	73	1,650	21	1,744	1,209
Roswell	3,579	2,386	5,965	98	4,137	21	4,256	1,709
Santa Fe	2,886	2,538	5,424	12	3,096	15	3,123	2,301
Tucumcari	724	834	1,558	34	1,224	29	1,287	271
North Dakota:								
Bismarck	156	315	471	5	364	5	374	97
Dickinson	441	692	1,133	19	807	5	831	302
Minot	146	739	885	4	798	6	808	77
Williston	131	592	723	6	613	3	622	101
Oklahoma:								
Guthrie	112	1,290	1,402	87	1,185	.....	1,272	130
Oregon:								
Burns	710	585	1,295	9	659	28	696	599
La Grande	1,256	1,191	2,447	7	1,283	100	1,390	1,057
Lakeview	260	617	877	24	591	29	644	233
Portland	307	1,483	1,790	39	1,586	4	1,629	161
Roseburg	144	589	733	15	663	7	685	48
The Dalles	1,474	1,869	3,343	47	1,708	101	1,856	1,487
Vale	659	833	1,492	1	921	72	994	498
South Dakota:								
Bellefourche	1,249	958	2,207	15	1,123	33	1,171	1,036
Gregory	147	389	536	6	436	.....	442	94
Lemmon	629	1,144	1,773	11	1,437	25	1,473	300
Pierre	416	689	1,105	2	695	179	876	229
Rapid City	2,094	1,680	3,774	11	1,984	35	2,030	1,744
Timber Lake	572	795	1,367	1	826	.....	827	540
Utah:								
Salt Lake City	1,821	2,337	4,158	5	2,224	110	2,339	1,819
Vernal	68	410	478	.....	405	5	410	68
Washington:								
Seattle	11	184	195	1	193	.....	194	1
Spokane	173	758	931	3	767	20	790	141
Vancouver	39	163	202	1	153	3	157	45
Walla Walla	181	421	602	36	348	24	408	194
Waterville	584	885	1,469	26	991	47	1,064	405
Yakima	209	303	512	1	364	6	371	141
Wisconsin:								
Wausau	15	184	199	3	179	3	185	14
Wyoming:								
Buffalo	1,870	2,788	4,658	22	2,601	49	2,672	1,986
Cheyenne	1,848	4,276	6,124	37	4,617	50	4,704	1,420
Douglas	2,375	4,443	6,818	36	3,052	160	3,248	3,570
Evanston	241	924	1,165	12	802	58	872	293
Lander	370	1,314	1,684	17	1,207	53	1,277	407
Sundance	2,539	3,820	6,359	169	3,621	174	3,964	2,395
Grand total	68,643	128,664	197,307	2,944	129,917	4,523	137,384	59,923

Expenditures during the fiscal year ended June 30, 1919, in connection with surveying activities.

	Salaries, offices of surveyors general.	Contingent expenses, offices of surveyors general.	Surveying the public lands.	Deposits by individuals for surveying public lands.	Surveying within land grants (reimbursable).	Miscellaneous.[1]	Indian surveys.	Total.
Alaska	$13,849.27	$2,003.33	[2] $53,825.67	$1,947.67		$1,078.64		$72,794.58
Arizona	17,999.76	262.93	53,320.51	3,796.46	$4,195.47	2,788.01	$949.43	83,312.57
California	15,395.45	1,178.67	40,771.24	3,414.94	8,045.61	2,095.30	304.59	71,205.80
Colorado	19,841.91	697.42	34,391.79	3,189.14		2,097.83	109.50	60,230.62
Idaho	13,944.98	257.63	44,642.90	884.73		1,446.00	48.07	61,224.31
Montana	18,299.33	183.20	57,117.80	19,852.56		2,630.01	7,884.31	105,967.21
Nebraska			27,217.05			445.65		27,662.70
Nevada	14,088.44	266.43	37,373.17	1,305.38	568.24	1,276.87		54,878.53
New Mexico	20,062.44	360.20	43,217.61	202.12		2,119.66	13,985.01	79,947.34
Oregon	11,448.33	355.56	30,340.30	95.83		988.33	7,857.50	51,085.85
South Dakota	5,085.78	50.05		79.89		354.33		5,570.05
Utah	11,087.88	577.22	46,076.07	3,991.91		1,731.52	201.48	66,666.08
Washington	11,831.56	369.05	42,741.81	999.65	31.32	1,005.16	8,041.23	65,622.78
Wyoming	11,144.00	117.63	36,804.00			1,346.64		49,412.27
General Land Office[3]		1,418.50	41,496.54	1,906.84	2,356.18	1,784.76	10,837.48	59,800.30
Total	187,082.16	8,187.82	589,336.46	41,667.42	15,199.82	23,788.71	50,218.60	915,480.99

[1] Includes "Appraisal and sale of abandoned military reservations," "Increase of compensation, Interior Department," deposits for land-grant surveys, act of Mar. 2,1917, and deposits for resurveys, act of Sept. 21, 1918.
[2] Includes expenditures of disbursing officers other than surveyors general.
[3] Includes expenditures by Frank A. Lewis.

Sales of Indian lands during fiscal year ended June 30, 1919.

Land Office—Indian tribe.	Entries and segregations.				Receipts, sales, and interest.
	Number.		Acres.		
	Original.	Final.	Original.	Final.	
Arizona:					
Phoenix					$1,685.26
California:					
El Centro—Yuma	2	12	58.16	486.41	5,421.31
Eureka—Round Valley		1		147.49	578.00
San Francisco—Round Valley		33		4,566.45	17,691.05
Colorado:					
Durango—Ute (acts June 15, 1880, and July 28, 1882)	117	41	20,471.66	6,919.44	4,554.44
Southern Ute (act Feb. 20, 1895)	70	85	21,333.40	12,878.42	2,698.48
Glenwood Springs—Ute (acts June 15, 1880, and July 28, 1882)	176	161	39,218.27	26,513.93	10,809.13
Montrose—Ute (acts June 15, 1880, and July 28, 1882)	134	69	28,035.58	9,068.60	18,866.88
Idaho:					
Coeur d'Alene—					
Act June 21, 1906	11	34	1,318.80	4,193.87	2,942.45
Town lots		8			246.08
Kansas:					
Dodge City—Osage		4		160.00	272.14
Minnesota:					
Cass Lake—Chippewa	597	732	90,728.35	105,418.23	139,717.40
Crookston—					
Chippewa	328	497	46,335.10	71,181.16	82,365.91
Red Lake	5	32	326.80	2,611.92	12,592.08
Duluth—Chippewa	15	12	1,818.87	1,088.70	1,360.88
Montana:					
Billings—Crow	23	107	8,468.35	27,324.83	82,634.61
Town lots [1]		20			
Glasgow—Fort Peck	155	207	28,945.92	38,233.79	201,470.37
Town lots		53			11,599.72
Kalispell—Flathead	11	29	866.17	3,044.02	11,788.15
Town lots	3	46			632.50
Villa sites		182		738.62	12,287.65
Missoula—Flathead	19	63	1,380.21	7,491.91	13,572.62
Town lots	106	45			13,659.81
Sales—Timber lands					1,883.10
North Dakota:					
Bismarck—Standing Rock	24	1	3,914.70	160.00	5,105.29
Minot—Devils Lake	1	5	157.69	251.43	517.64
Fort Berthold—					
Act June 1, 1910	22	290	2,549.11	43,661.35	173,648.87
Town lots		129			7,308.04
Oklahoma:					
Guthrie—					
Cheyenne and Arapahoe		5		399.83	25,756.95
Kiowa, Comanche, and Apache		147		21,408.48	176,999.63
Lawton town lots		134			16,529.72
Hospital fund					11,127.47
Oregon:					
La Grande—Umatilla	10	44	398.48	4,145.90	2,234.75
Portland—Siletz					11,814.07
South Dakota:					
Gregory—					
Rosebud	65	161	13,181.61	26,390.97	41,994.23
Pine Ridge	82	50	30,008.11	9,916.89	17,105.90
Town lots [1]	8	37			
Lemmon—Standing Rock	125	145	37,301.15	25,615.97	61,962.31
Pierre—Lower Brule					83.20
Timber Lake—					
Cheyenne River	218	164	61,455.87	26,493.33	113,688.74
Standing Rock	40	51	13,191.57	8,398.15	26,268.17
Town lots [1]	340	91			
Utah:					
Vernal—					
Uintah	18	56	2,414 91	6,485.81	8,204.25
Town lots		86			2,240.57
Washington:					
Spokane—					
Colville	99	56	18,142.62	5,916.43	6,313.84
Spokane	2	15	240.00	1,306.70	3,624.83
Town lots		5			890.55
Waterville—					
Colville	107	63	23,429.77	9,931.69	13,241.19
Town lots		35			1,561.46
Wyoming:					
Lander—Shoshone	6	16	671.89	2,338.00	8,230.02
Total	2,949	4,244	505,363.12	514,888.72	1,387,781.74

[1] Moneys received for these town lots and villa sites included in aggregate "Receipts, sales, and interest" for each reservation period.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919.

Location.	Number of applications, entries, etc. (original and final).	Area.			Receipts for allowed applications and entries.[1]				Indian.[2]	Total earnings.[2]	Expenses.		
		Entered.		Patented.	Fees and commissions.		Purchase money.	Total.			Salaries and commissions, registers and receivers.	Incidental.	Total.
		Original.	Final.		Indian lands.	Public lands.							
		Acres.	*Acres.*	*Acres.*									
Alabama, Montgomery	377	14,438.87	17,404.20	38,137.680	.....	$2,760.85	$4,269.97	$7,030.82	.....	$7,063.02	$2,768.44	$1,586.10	$4,354.54
Alaska:													
Fairbanks	60	2,201.28	3,227.49	1,535.393	.....	370.81	3,227.50	3,598.31	.....	31,402.72	857.30	2,539.00	3,396.30
Juneau	122	4,594.45	6,371.89	4,134.679	.....	979.92	5,849.38	6,829.30	.....	28,631.68	4,128.80	3,082.43	7,211.23
Nome	35	.....	1,337.45	1,929.462	.....	160.00	2,637.50	2,797.50	.....	8,976.75	342.15	.....	342.15
Arizona, Phoenix	2,922	512,855.03	155,655.28	152,997.532	.....	28,484.36	49,680.37	78,164.73	$1,685.26	85,453.90	6,000.00	9,292.14	15,292.14
Indian and private land grants	.....	.....	.....	8,650.950	.....	.....	.....	.....	.....	.....	.....	.....	.....
Arkansas:													
Camden	291	8,738.32	12,441.04	20,812.600	.....	1,693.35	6,084.44	7,777.79	.....	7,788.41	2,083.36	1,650.36	3,733.72
Harrison	952	39,981.19	39,697.84	51,673.920	.....	6,094.22	3,167.18	9,261.40	.....	9,249.67	4,005.76	2,510.42	6,516.18
Little Rock	927	30,067.77	50,439.01	53,290.820	.....	5,508.02	11,083.05	16,591.07	.....	18,731.99	4,430.38	3,500.13	7,930.51
California:													
El Centro	262	44,267.99	9,446.79	12,727.797	$31.16	2,379.79	11,097.77	13,508.72	5,421.31	21,817.84	3,929.89	3,666.05	7,595.94
Eureka	175	16,857.80	6,220.54	9,001.220	.....	1,931.02	2,593.26	4,524.28	578.00	5,096.48	2,201.66	10.00	2,211.66
Independence	418	47,194.37	20,937.73	18,583.239	.....	5,119.99	12,722.21	17,842.20	.....	24,832.53	4,524.47	259.57	4,784.04
Los Angeles	1,251	137,709.14	85,810.57	84,518.500	.....	15,460.14	20,379.60	35,839.74	.....	43,081.39	6,000.00	7,188.39	13,188.39
Sacramento	778	63,122.03	48,257.12	68,179.712	.....	8,931.07	11,678.64	20,609.71	.....	21,306.50	6,000.00	3,851.16	9,851.16
San Francisco	871	127,992.00	41,030.10	72,976.190	.....	11,495.11	19,643.24	31,138.35	17,691.05	48,929.45	6,000.00	3,500.60	9,500.60
Susanville	304	24,406.93	22,611.91	34,920.225	.....	3,152.44	4,724.31	8,176.75	.....	10,783.56	3,374.66	1,615.77	4,990.43
Visalia	487	58,984.42	32,335.43	32,736.951	.....	6,946.16	9,360.37	16,306.53	.....	16,728.31	5,459.42	3,840.00	9,299.42
Indian and private land grants	.....	.....	.....	1,943.810	.....	.....	.....	.....	.....	.....	.....	.....	.....
Colorado:													
Del Norte	288	79,648.06	11,562.73	11,240.826	.....	5,241.15	5,575.63	10,816.78	.....	21,979.89	4,574.04	321.95	4,895.99
Denver	1,163	80,781.70	137,576.65	187,012.859	.....	13,492.62	35,856.86	49,349.48	.....	54,392.13	6,000.00	5,310.38	11,310.38
Durango	243	34,808.96	10,683.19	29,731.118	4,425.58	3,405.52	5,480.61	13,321.71	7,252.92	19,426.36	6,000.00	1,806.00	7,806.00
Glenwood Springs	1,278	257,105.48	39,042.11	62,552.120	3,500.82	21,102.42	6,097.53	30,700.77	10,809.13	40,245.90	6,000.00	4,203.33	10,203.33
Hugo	296	8,699.87	55,506.54	66,636.310	.....	4,737.21	924.19	5,661.40	.....	5,667.94	5,253.70	2,342.00	7,595.70
Lamar	2,642	253,909.41	442,849.68	385,061.890	.....	39,269.33	7,160.40	46,429.73	.....	48,613.70	6,000.00	5,504.39	11,504.39
Leadville	283	23,673.02	9,822.46	6,908.587	.....	6,238.50	6,098.75	9,337.25	.....	9,022.10	2,909.07	15.60	2,924.67
Montrose	640	49,067.33	34,185.29	45,174.583	1,828.26	6,689.26	8,230.69	16,748.21	18,866.88	35,773.38	6,000.00	4,191.72	10,191.72
Pueblo	3,515	719,722.24	266,568.61	248,495.735	.....	61,114.96	48,379.01	109,493.97	.....	109,601.68	6,000.00	6,081.27	12,081.27
Sterling	1,732	98,889.09	265,921.48	293,231.450	.....	21,277.04	7,815.91	29,092.95	.....	30,159.95	6,000.00	5,236.25	11,236.25
Florida, Gainesville	574	21,025.83	33,621.80	63,801.450	.....	4,281.78	6,612.73	10,894.51	.....	10,853.31	3,768.52	4,943.89	8,712.41

Idaho:														
Blackfoot	2,547	272,204.40	220,617.00	331,418,286		31,173.14	23,509.16	54,682.30		62,011.43	6,000.00	5,994.17	11,994.17
Boise	1,681	195,566.43	106,089.76	131,056,103		19,963.70	26,203.69	46,207.39		47,332.72	6,000.00	4,371.17	10,371.17
Coeur d'Alene	183	6,548.18	8,990.78	19,809,657	296.60	1,932.32	6,877.15	9,056.07	3,188.53	12,167.35	2,889.00	2,036.12	4,925.12
Hailey	1,516	126,534.32	128,229.15	245,799,150		15,191.15	23,805.95	38,997.10		44,535.40	6,000.00	5,221.33	11,221.33
Lewiston	508	51,340.65	35,784.26	56,856,492		6,148.30	4,249.02	10,397.32		10,327.13	5,007.78	1,619.50	6,627.28
Illinois				485,620									
Indiana				1,560,000									
Iowa				277,268									
Kansas:													
Dodge City	494	43,776.27	59,485.37	40,018,830		5,893.00	1,165.40	7,058.40	272.14	7,339.14	5,217.32	3,613.00	8,830.32
Topeka	94	3,963.20	7,566.41	11,469,270		773.02	240.00	983.02		952.02	1,596.22	50.00	1,556.22
Louisiana, Baton Rouge	292	7,447.88	18,325.29	33,521,350		3,351.19	9,214.44	12,565.63		12,568.03	3,857.76	5,070.70	8,928.46
Michigan, Marquette	176	7,222.50	6,773.57	8,905,800		1,374.86	6,577.72	7,952.58		8,622.23	2,118.77	35.75	2,154.52
Minnesota:													
Cass Lake	55	1,142.48	2,152.54	109,006,100	10,698.00	1,008.53	305.00	12,011.53	139,717.40	151,773.98	6,000.00	4,018.00	10,018.00
Crookston	245	14,483.99	18,330.40	145,899,620	5,993.13	2,520.33	14,625.86	23,139.32	94,957.99	119,578.46	6,000.00	2,045.66	8,045.66
Duluth	274	4,055.81	14,722.74	14,252,550	202.69	1,351.38	4,110.02	5,664.09	1,369.88	7,132.27	2,187.40	1,700.00	3,887.40
Indian and private land grants				3,653,410									
Mississippi:													
Jackson	311	7,808.98	12,773.10	17,640,130		2,648.47	5,786.98	8,435.45		8,571.75	3,239.40	2,176.68	5,416.08
Indian and private land grants				4,032,380									
Missouri, Springfield	49	400.00	2,649.55	3,026,715		322.33	1,586.11	1,908.44		1,946.21	846.80	612.00	1,458.80
Montana:													
Billings	834	41,928.27	129,942.81	216,050,079	1,588.41	14,716.84	4,237.51	20,542.76	82,634.61	105,528.01	6,000.00	3,665.17	9,665.17
Bozeman	758	58,274.70	94,785.48	127,534,611		10,708.21	8,112.20	18,820.41		19,359.26	6,000.00	2,695.25	8,695.25
Glasgow	2,672	220,920.93	395,481.40	701,131,484	4,005.06	34,465.35	27,432.01	65,902.42	213,070.09	280,505.17	6,000.00	8,523.52	14,523.52
Great Falls	1,739	111,877.46	185,332.73	326,589,590		18,315.70	35,465.09	53,780.79		54,379.65	6,000.00	8,367.82	14,367.82
Havre	2,187	141,353.41	362,537.80	639,966,289		27,635.97	37,843.59	65,478.66		80,893.54	6,000.00	10,791.94	16,791.94
Helena	1,387	154,534.56	121,338.16	134,551,489		17,284.69	47,381.75	64,666.44		64,717.71	6,000.00	3,915.26	9,915.26
Kalispell	205	124,641.56	12,640.57	11,168,203	216.45	3,603.39	2,958.11	6,777.95	24,708.39	31,602.71	4,651.69	171.00	4,822.69
Lewistown	2,264	171,299.04	289,881.14	489,365,933		27,325.91	44,816.25	72,141.26		73,693.14	6,000.00	8,686.00	14,686.00
Miles City	3,746	534,464.94	499,832.23	619,188,121		70,944.26	32,214.49	103,158.75		104,970.02	6,000.00	9,438.17	15,438.17
Missoula	286	60,139.27	22,480.68	32,855,401	453.23	4,690.04	10,704.24	15,847.51	29,115.53	45,189.56	5,622.50	2,615.70	8,238.20
Indian and private land grants				117,934,820									
Nebraska:													
Alliance	313	14,133.32	53,339.94	93,930,100		2,775.45	8,162.66	10,938.11		10,929.61	3,016.22	2,642.81	5,660.03
Broken Bow	398	18,908.03	98,149.06	122,592,580		3,256.53	16,872.28	20,128.81		19,760.38	3,754.90	2,535.00	3,289.90
Lincoln	61	3,057.36	3,691.87	1,767,750		692.18	990.00	1,682.18		1,799.58	1,490.72	553.00	2,043.72
North Platte [3]	56	1,877.59	13,749.73	36,390,260		505.67	240.00	745.67		741.67	846.12	919.00	1,765.12
O'Neill [3]	35	1,830.31	2,318.39	9,778,920		353.08	13.40	366.48		375.48	681.83	442.50	1,124.33
Valentine [3]	207	7,798.32	49,992.80	66,741,020		1,392.54	13,585.58	14,978.12		13,955.89	1,674.74	1,043.50	2,718.24

[1] Moneys reported under the heading "Receipts for allowed applications and entries" may in several cases exceed the total earnings from all sources for an individual office. This is due to the fact that lands are considered entered only when a certificate of allowance issues. The receipts where the receipts for "Allowed applications and entries" exceed the total earnings of an office include allowances during the fiscal year 1919, whereas its moneys were accounted for and reported as earned during the preceding fiscal year irrespective of whether the papers ever become an entry. This table does not include number and area of Indian Lands. See Indian table.

[2] These columns embrace moneys that are credited to the United States; for detailed earnings see following table.

[3] Discontinued December 31, 1918. North Platte and Valentine consolidated with Broken Bow; O'Neill with Lincoln

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919—Continued.

Location.	Number of applications, entries, etc. (original and final).	Area.			Receipts for allowed applications and entries.				Expenses.				
		Entered.		Patented.	Fees and commissions.		Purchase money.	Total.	Indian.	Total earnings.	Salaries and commissions, registers and receivers.	Incidental.	Total.
		Original.	Final.		Indian lands.	Public lands.							
		Acres.	*Acres.*	*Acres.*									
Nevada:													
Carson City	398	37,266.76	14,984.32	212,457.774	.....	$3,873.44	$10,825.22	$14,698.66	.....	$15,110.40	$3,663.53	$1,352.40	$5,015.93
Elko	242	255,606.82	17,123.81	53,505.034	.....	5,895.68	6,615.74	12,511.42	.....	14,510.94	4,408.33	2,985.75	7,394.08
Indian and private land grants	.....	.....	.....	10.000	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Mexico:													
Clayton	1,596	183,473.97	199,316.00	183,558.890	.....	20,849.28	12,026.31	32,875.59	.....	32,887.59	6,000.00	6,116.00	12,116.00
Fort Sumner	1,253	399,707.00	49,752.43	56,632.080	.....	27,120.51	1,445.09	28,565.60	.....	28,800.75	5,971.81	4,612.89	10,584.70
Las Cruces	728	118,744.81	45,842.62	67,523.489	.....	8,353.02	16,930.03	25,283.05	.....	25,663.85	6,000.00	5,198.32	11,198.32
Roswell	2,598	722,660.69	116,151.51	142,387.478	.....	50,889.88	4,217.56	55,107.44	.....	56,524.70	6,000.00	6,981.75	12,981.75
Santa Fe	2,703	624,304.86	174,252.74	451,873.220	.....	48,441.38	5,990.75	54,432.13	.....	56,771.40	6,000.00	9,232.79	15,232.79
Tucumcari	1,014	156,600.00	72,096.38	117,922.120	.....	14,917.74	3,677.53	18,595.27	.....	18,316.37	6,000.00	6,159.84	12,159.84
Indian and private land grants	.....	.....	.....	203,793.230	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Dakota:													
Bismarck	258	7,105.85	16,731.86	24,068.260	$328.55	2,240.50	1,350.60	3,919.65	$5,105.29	9,076.35	2,861.71	1,106.00	3,967.71
Dickinson	657	45,038.85	73,376.67	102,623.310	.....	7,457.35	958.87	8,416.22	.....	8,609.17	6,000.00	3,975.95	9,975.95
Minot	204	5,804.14	12,791.72	75,347.605	1,330.97	1,917.44	503.88	3,752.29	181,474.55	185,482.84	5,891.67	1,567.00	7,458.67
Williston	514	13,896.34	63,294.97	102,790.240	.....	3,379.09	2,635.13	6,014.22	.....	6,013.22	3,534.69	2,807.42	6,342.11
Indian and private land grants	.....	.....	.....	11,859.010	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ohio	.....	.....	.....	158.650	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oklahoma:													
Guthrie	512	30,448.30	27,450.10	58,930.534	526.08	4,194.46	25,488.07	30,208.61	230,413.77	243,104.29	5,822.00	2,204.00	8,026.00
Indian and private land grants	.....	.....	.....	80.000	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oregon:													
Burns	463	73,548.35	55,038.97	70,925.420	.....	6,616.90	7,106.33	13,723.23	.....	14,520.91	6,000.00	2,251.20	8,251.20
La Grande	892	47,404.57	98,604.00	103,540.410	.....	8,458.00	11,464.64	19,922.64	2,234.75	18,935.88	6,000.00	3,862.00	9,862.00
Lakeview	465	27,131.98	59,140.73	87,575.200	.....	4,861.67	26,619.50	31,481.17	.....	32,136.60	5,115.57	2,082.30	7,197.87
Portland	593	51,015.14	9,541.53	13,205.209	.....	8,338.54	62,384.08	70,722.62	11,814.07	82,299.39	5,473.85	4,828.60	10,302.45
Roseburg	378	17,335.24	13,232.17	33,223.224	.....	4,221.37	43,600.62	47,821.99	.....	60,277.10	4,063.34	3,294.50	7,357.84
The Dalles	916	61,383.27	108,407.34	117,778.520	.....	10,396.05	12,935.06	23,331.11	.....	23,502.09	6,000.00	3,207.50	9,207.50
Vale	737	143,118.04	53,379.27	51,167.050	.....	11,727.38	12,487.17	24,214.55	.....	25,306.04	6,000.00	1,790.19	7,790.19
Indian and private land grants	.....	.....	.....	777.410	.....	.....	.....	.....	.....	.....	.....	.....	.....

South Dakota:													
Bellefourche	886	122,644.34	64,285.76	74,545.021	.....	9,262.36	7,498.54	16,760.90	.....	17,596.24	6,000.00	3,680.75	9,680.75
Gregory	21	876.42	2,727.69	32,290.997	3,358.88	691.04	131.26	4,161.18	59,100.16	63,274.94	4,821.74	2,237.16	7,058.95
Lemmon	908	85,607.23	67,743.26	96,317.420	2,793.59	8,419.75	4,277.86	15,491.20	61,962.31	77,159.56	6,000.00	4,303.75	10,303.70
Pierre	521	90,101.07	23,850.25	23,138.720	.....	6,486.83	7,844.46	14,331.29	83.20	14,614.49	4,501.66	1,651.00	6,152.66
Rapid City	1,469	260,329.92	60,519.46	85,177.819	.....	18,219.68	12,780.55	31,000.23	.....	31,583.56	6,000.00	6,340.07	12,340.07
Timber Lake	.....	.....	.....	100,583.625	5,275.37	316.61	.....	5,591.98	139,956.91	145,098.77	4,833.33	3,874.50	8,707.83
Indian and private land grants	.....	.....	.....	43,706.450	.....	.....	.....	.....	.....	.....	.....	.....	.....
Utah:													
Salt Lake City	1,523	192,996.55	136,326.23	151,342.971	.....	21,439.69	169,693.00	191,132.69	.....	126,077.70	6,000.00	7,063.67	13,063.67
Vernal	125	17,276.78	6,435.60	22,188.750	488.74	1,736.94	6,679.90	8,905.58	10,444.82	20,044.83	2,892.53	1,052.85	3,945.38
Indian and private land grants	.....	.....	.....	602.050	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington:													
Seattle	89	17,872.53	3,258.03	29,786.144	.....	881.43	7,967.25	8,848.68	.....	8,948.43	1,940.47	2,696.50	4,636.97
Spokane	363	23,296.75	29,958.59	44,772.515	1,863.44	4,491.51	5,988.12	12,343.07	10,829.22	24,353.90	5,702.02	2,237.25	7,939.27
Vancouver	110	3,458.28	8,149.87	12,200.280	.....	1,094.47	2,142.34	3,236.81	.....	3,791.78	1,990.99	1,572.25	3,563.24
Walla Walla	295	13,066.77	31,897.71	31,717.390	.....	3,109.64	7,941.71	11,051.35	.....	12,249.76	3,705.22	1,101.00	4,806.22
Waterville	436	39,147.82	28,770.30	60,735.205	2,139.00	4,849.39	2,663.47	9,651.86	14,802.65	25,330.43	5,825.63	3,079.22	8,904.85
Yakima	269	52,641.93	13,578.10	33,813.710	.....	5,904.27	8,796.65	14,700.92	.....	16,116.64	5,901.04	1,517.10	7,418.14
Indian and private land grants	.....	.....	.....	2,281.800	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin:													
Wausau	118	2,577.32	4,375.04	7,772.830	.....	918.72	710.00	1,628.72	.....	1,816.74	1,747.90	22.20	1,770.10
Indian and private land grants	.....	.....	.....	160.000	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wyoming:													
Buffalo	1,207	245,783.41	74,857.91	57,240.760	.....	19,698.24	23,525.14	43,223.38	.....	48,166.33	6,000.00	5,593.47	11,593.47
Cheyenne	3,028	597,295.76	178,052.04	197,239.058	.....	60,678.21	10,408.30	71,086.51	.....	67,181.51	6,000.00	5,777.42	11,777.42
Douglas	2,015	564,096.20	61,373.58	66,788.832	.....	39,580.73	10,757.04	50,337.77	.....	50,909.56	6,000.00	5,859.50	11,859.50
Evanston	483	41,379.71	30,294.09	49,522.040	.....	4,394.20	127,945.48	132,339.68	.....	132,619.59	6,000.00	1,545.00	7,545.00
Lander	718	45,851.23	24,647.02	31,541.486	154.73	5,411.70	69,286.41	74,852.84	8,230.02	101,342.39	6,000.00	2,133.65	8,133.65
Sundance	2,938	757,612.28	104,392.76	135,786.620	.....	56,686.66	13,155.96	69,842.62	.....	81,746.66	6,000.00	4,520.47	10,520.47
Indian and private land grants	.....	.....	.....	100.000	.....	.....	.....	.....	.....	.....	.....	.....	.....
Made at General Land Office	7	.....	164.23	.....	.....	5.05	967.00	972.05	.....	.....	.....	.....	.....
Land offices discontinued	.....	.....	.....	10,911.280	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	83,079	11,365,818.38	7,074,758.60	10,777,001.349	51,488.74	1,146,339.57	1,506,089.45	2,703,917.69	1,387,781.74	4,204,844.65	457,889.82	337,094.80	794,984.62

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919.

States—offices.	Total earnings in detail.								
	Fees and commissions.	Sales of public lands.	Total.	Sales of Government property.	Outstanding liabilities—lands, act Mar. 2, 1907.	Sales of reclamation town sites.	Sales of lands in Oregon and California railroad grant.	Sales of Indian lands.	Aggregate.
Alabama, Montgomery	$2,793.05	$4,269.97	$7,063.02						$7,063.02
Alaska:									
Fairbanks	367.31	31,017.88	31,385.19		$17.53				31,402.72
Juneau	949.92	27,681.76	28,631.68						28,631.68
Nome	184.30	7,892.45	8,076.75						8,076.75
Total	1,501.53	66,592.09	68,093.62		17.53				68,111.15
Arizona, Phoenix	29,370.69	54,397.95	83,768.64					$1,685.26	85,453.90
Arkansas:									
Camden	1,702.64	6,085.77	7,788.41						7,788.41
Harrison	6,082.49	3,167.18	9,249.67						9,249.67
Little Rock	5,572.35	13,155.64	18,727.99		4.00				18,731.99
Total	13,357.48	22,408.59	35,766.07		4.00				35,770.07
California:									
El Centro	3,217.03	13,093.24	16,310.67		86.26			5,421.31	21,817.84
Eureka	1,945.22	2,573.26	4,518.48					578.00	5,096.48
Independence	5,252.09	19,579.54	24,832.53						24,832.53
Los Angeles	15,459.41	27,621.98	43,081.39						43,081.39
Sacramento	8,907.96	12,398.54	21,306.50						21,306.50
San Francisco	11,670.04	19,568.36	31,238.40					17,691.05	48,929.45
Susanville	3,510.74	7,272.82	10,783.56						10,783.56
Visalia	6,946.16	9,782.07	16,728.23						16,728.23
Total	56,909.55	11,889.81	168,799.36		86.26			23,690.36	192,575.98
Colorado:									
Del Norte	5,295.70	16,684.19	21,979.89						21,979.89
Denver	13,617.37	40,774.76	54,392.13						54,392.13
Durango	7,943.10	4,230.34	12,173.44					7,252.92	19,426.36
Glenwood Springs	24,033.72	5,247.55	29,341.27		95.50			10,809.13	40,245.90
Hugo	4,743.75	921.19	5,667.94						5,667.94
Lamar	39,539.47	9,074.23	48,613.70						48,613.70
Leadville	3,298.50	5,778.75	9,077.25		4.85				9,022.10

Montrose	8,524.40	8,382.10	16,906.50					18,866.88	35,773.38
Pueblo	61,143.55	48,458.13	109,601.68						109,601.68
Sterling	21,359.63	8,800.32	30,159.95						30,159.95
Total	189,490.19	148,354.56	337,853.75		100.35			36,928.93	374,883.03
Florida, Gainesville	4,250.58	6,602.73	10,853.31						10,853.31
Idaho:									
Blackfoot	31,287.07	30,724.36	62,011.43						62,011.43
Boise	19,986.35	27,346.37	47,332.72						47,332.72
Coeur d'Alene	2,281.67	6,697.15	8,978.82					3,188.53	12,167.35
Hailey	15,274.80	23,462.51	38,737.31			5,798.09			44,535.40
Lewiston	6,093.65	4,233.48	10,327.13						10,327.13
Total	74,923.54	92,463.87	167,387.41			5,798.09		3,188.53	176,374.03
Kansas:									
Dodge City	5,803.60	1,165.40	7,059.00		8.00			272.14	7,339.14
Topeka	742.02	210.00	952.02						952.02
Total	6,535.62	1,375.40	8,011.02		8.00			272.14	8,291.16
Louisiana, Baton Rouge	3,353.59	9,214.44	12,568.03						12,568.03
Michigan, Marquette	1,508.52	7,113.71	8,622.23						8,622.23
Minnesota:									
Cass Lake	11,751.58	305.00	12,056.58					139,717.40	151,773.98
Crookston	8,602.26	7,018.21	15,620.47					94,957.99	110,578.46
Duluth	1,620.31	4,151.08	5,771.39					1,360.88	7,132.27
Total	21,974.15	11,474.29	33,448.44					236,036.27	269,484.71
Mississippi, Jackson	2,790.79	5,780.96	8,571.75						8,571.75
Missouri, Springfield	360.10	1,586.11	1,946.21						1,946.21
Montana:									
Billings	15,405.52	3,998.83	19,404.35			3,489.05		82,634.61	105,528.01
Bozeman	10,694.98	8,664.28	19,359.26						19,359.26
Glasgow	38,487.64	28,947.44	67,435.08					213,070.09	280,505.17
Great Falls	18,231.26	36,008.62	54,239.88		60.00	79.77			54,379.65
Havre	27,652.25	61,952.06	89,604.31			289.23			89,893.54
Helena	17,448.15	47,269.56	64,717.71						64,717.71
Kalispell	3,831.45	3,057.96	6,889.41	85.00				24,708.30	31,602.71
Lewistown	27,359.38	46,286.76	73,646.14		47.00				73,693.14
Miles City	70,521.43	34,292.99	104,814.42		155.60				104,970.02
Missoula	5,272.92	10,778.61	16,051.53		22.50			29,115.53	45,189.56
Total	234,904.98	281,257.11	516,162.09	5.00	285.10	3,858.05		349,528.53	869,838.77

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919—Continued.

States—offices.	Total earnings in detail.								
	Fees and commissions.	Sales of public lands.	Total.	Sales of Government property.	Outstanding liabilities—lands, act Mar. 2, 1907.	Sales of reclamation town sites.	Sales of lands in Oregon and California railroad grant.	Sales of Indian lands.	Aggregate.
Nebraska:									
Alliance	$2,757.95	$8,162.66	$10,920.61						$10,920.61
Broken Bow	3,295.69	16,464.69	19,760.38						19,760.38
Lincoln	775.33	1,024.25	1,799.58						1,799.58
North Platte	[1] 471.32	240.00	711.32	$30.35					741.67
O'Neill	[1] 301.83		301.83	73.65					375.48
Valentine	[1] 1,392.54	11,609.60	13,002.14	53.75					13,055.89
Total	8,994.66	37,501.20	46,495.86	157.75					46,653.61
Nevada:									
Carson City	4,026.79	11,083.61	15,110.40						15,110.40
Elko	5,942.35	8,568.59	14,510.94						14,510.94
Total	9,969.14	19,652.20	29,621.34						29,621.34
New Mexico:									
Clayton	20,881.28	12,006.31	32,887.59						32,887.59
Fort Sumner	27,236.31	1,445.09	28,681.40		$119.35				28,800.75
Las Cruces	8,989.52	16,627.23	25,616.75	47.10					25,663.85
Roswell	51,056.08	5,468.62	56,524.70						56,524.70
Santa Fe	48,382.59	8,388.81	56,771.40						56,771.40
Tucumcari	14,929.21	3,387.16	18,316.37						18,316.37
Total	171,474.99	47,323.22	218,798.21	47.10	119.35				218,964.66
North Dakota:									
Bismarck	2,595.05	1,376.01	3,971.06					$5,105.29	9,076.35
Dickinson	7,509.05	958.87	8,467.92	141.25					8,609.17
Minot	3,304.41	703.88	4,008.29					181,474.55	185,482.84
Williston	3,378.09	2,635.13	6,013.22						6,013.22
Total	16,786.60	5,673.89	22,460.49	141.25				186,579.84	209,181.58
Oklahoma, Guthrie	6,144.94	6,545.58	12,690.52					230,413.77	243,104.29

Oregon:									
Burns	6,753.59	7,767.32	14,520.91						14,520.91
La Grande	7,112.28	9,588.85	16,701.13					2,234.75	18,935.88
Lakeview	4,832.69	27,273.91	32,136.60						32,136.60
Portland	8,389.74	1,547.02	9,936.76				$60,548.56	11,814.07	82,299.39
Roseburg	4,216.83	2,600.51	6,817.34				53,459.76		60,277.10
The Dalles	10,467.03	13,035.06	23,502.09						23,502.09
Vale	11,816.10	13,489.94	25,306.04						25,306.04
Total	53,618.26	75,302.61	128,920.87				114,008.32	14,048.82	256,978.01
South Dakota:									
Bellefourche	9,304.48	3,259.47	12,563.95			$4,942.29			17,506.24
Gregory	4,042.52	132.26	4,174.78					59,100.16	63,274.94
Lemmon	11,319.39	3,877.86	15,197.25					61,962.31	77,159.56
Pierre	6,486.83	8,044.46	14,531.29					83.20	14,614.49
Rapid City	18,255.50	13,328.06	31,583.56						31,583.56
Timber Lake	5,141.86		5,141.86					139,956.91	145,098.77
Total	54,550.58	28,642.11	83,192.69			4,942.29		261,102.58	349,237.55
Utah:									
Salt Lake City	20,675.87	105,401.83	126,077.70						126,077.70
Vernal	2,286.23	7,313.78	9,600.01					10,444.82	20,044.83
Total	22,962.10	112,715.61	135,677.71					10,444.82	146,122.53
Washington:									
Seattle	948.53	7,999.90	8,948.43						8,948.43
Spokane	6,353.11	7,171.57	13,524.68					10,829.22	24,353.90
Vancouver	1,148.12	2,643.66	3,791.78						3,791.78
Walla Walla	3,119.04	9,130.72	12,249.76						12,249.76
Waterville	7,161.81	3,365.97	10,527.78					14,802.65	25,330.43
Yakima	5,922.19	10,194.45	16,116.64						16,116.64
Total	24,652.80	40,506.27	65,159.07					25,631.87	90,790.94
Wisconsin, Wausau	1,006.74	810.00	1,816.74						1,816.74
Wyoming:									
Buffalo	19,738.51	28,427.82	48,166.33						48,166.33
Cheyenne	54,855.80	12,325.71	67,181.51						67,181.51
Douglas	39,640.57	11,268.99	50,909.56						50,909.56
Evanston	4,514.58	128,105.01	132,619.59						132,619.59
Lander	5,688.43	58,258.51	63,846.94			29,265.43		8,230.02	101,342.39
Sundance	55,840.04	25,906.62	81,746.66						81,746.66
Total	180,277.93	264,292.66	444,470.59			29,265.43		8,230.02	481,966.04
Aggregate all States	1,194,472.10	1,463,746.94	2,658,219.04	351.10	620.59	43,863.86	114,008.32	1,387,781.74	4,204,844.65

[1] Office discontinued Dec. 31, 1918.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919—Continued.

States—offices.	Total earnings in detail.								
	Fees and commissions.	Sales of public lands.	Total.	Sales of Government property.	Outstanding liabilities—lands, act Mar. 2, 1907.	Sales of reclamation town sites.	Sales of lands in Oregon and California railroad grant.	Sales of Indian lands.	Aggregate.
General Land Office:									
Sales of public lands		$972.05	$972.05						$972.05
Depredations, public									29,927.20
Power permits									7,411.17
Coal leases									36,530.09
Proceeds of mineral or reserved lands Tanana Valley, Alaska									150.00
Copies of records									16,990.45
Offices of surveyors general:									
Sales of Government property				$868.62					868.62
Copies of records									5,979.93
Aggregate	$1,194,472.10	1,464,718.99	2,659,191.09	1,219.72	$920.59	$43,863.86	$114,008.32	$1,387,781.74	4,303,674.16

NOTE.—"Total earnings" are receipts credited to United States.

RECAPITULATION BY STATES.

Location.	Number of applications, entries, etc. (original and final).	Area.			Receipts for allowed applications and entries.				Indian.	Total. earnings.	Expenses.		
		Entered.		Patented.	Fees and commissions.		Purchase money.	Total.			Salaries and commissions, registers and receivers.	Incidental.	Total.
		Original.	Final.		Indian lands.	Public lands.							
		Acres.	*Acres.*	*Acres.*									
Alabama	377	14,438.87	17,404.20	38,137.680		$2,760.85	$4,269.97	$7,030.82		$7,063.02	$2,768.44	$1,586.10	$4,354.54
Alaska	217	6,795.73	10,936.83	7,599.534		1,510.73	11,714.38	13,225.11		68,111.15	5,328.25	5,621.43	10,949.68
Arizona	2,922	512,885.03	155,655.28	161,648.482		28,484.36	49,680.37	78,164.73	$1,685.26	85,453.90	6,006.00	9,292.14	15,292.14
Arkansas	2,170	78,787.28	102,577.89	125,777.340		13,295.59	20,334.67	33,630.26		35,770.07	10,519.50	7,660.91	18,180.41
California	4,546	520,534.68	266,650.19	335,878.644	$31.16	55,715.72	92,199.40	147,946.28	23,690.36	192,575.98	37,490.10	23,931.54	61,421.64
Colorado	12,080	1,606,305.16	1,273,718.74	1,336,045.178	9,764.66	179,568.01	131,589.58	320,922.25	36,928.93	374,883.03	54,736.81	35,012.89	89,749.70
Florida	574	21,025.83	33,621.80	63,801.450		4,281.78	6,612.73	10,894.51		10,853.31	3,768.52	4,943.89	8,712.41
Idaho	6,435	652,194.28	499,710.95	784,939.688	206.60	74,388.61	84,654.97	159,340.18	3,188.53	176,374.03	25,896.78	19,242.29	45,139.07
Illinois				485.620									
Indiana				1,560.000									
Iowa				277.268									
Kansas	588	47,739.47	67,051.78	51,488.100		6,666.02	1,375.40	8,041.42	272.14	8,291.16	6,723.54	3,663.09	10,386.54
Louisiana	292	7,447.88	18,325.29	33,521.350		3,351.19	9,214.44	12,565.63		12,568.03	3,857.76	5,070.70	8,928.46
Michigan	176	7,222.50	6,773.57	8,905.800		1,374.86	6,577.72	7,952.58		8,622.23	2,148.77	35.75	2,154.52
Minnesota	574	19,682.28	35,205.68	272,811.680	16,893.82	4,880.24	19,040.88	40,814.94	236,036.27	269,484.71	14,187.40	7,763.66	21,951.06
Mississippi	311	7,808.98	12,773.10	21,672.510		2,648.47	5,786.98	8,435.45		8,571.75	3,239.40	2,176.68	5,416.08
Missouri	49	400.00	2,649.55	3,026.715		322.33	1,586.11	1,908.44		1,946.21	846.80	612.00	1,458.80
Montana	16,078	1,619,425.23	2,114,253.30	3,446,336.090	6,263.15	229,688.56	251,165.24	487,116.95	349,528.53	869,838.77	58,274.19	58,869.83	117,144.02
Nebraska	1,070	47,614.90	221,241.79	331,110.630		8,975.45	39,863.92	48,839.37		46,653.61	11,464.53	8,136.81	19,601.34
Nevada	640	292,873.58	32,108.13	265,972.808		9,769.12	17,440.96	27,210.08		29,621.34	8,071.86	4,338.15	12,410.01
New Mexico	9,862	2,205,491.33	657,111.68	1,223,690.507		170,571.81	44,287.27	214,859.08		218,964.66	35,971.81	38,301.59	74,273.10
North Dakota	1,633	71,845.18	166,198.22	316,688.125	1,659.52	14,994.38	5,448.18	22,102.38	186,579.81	209,181.58	18,288.07	9,456.37	27,744.44
Ohio				158.650									
Oklahoma	512	30,448.30	27,159.10	59,010.534	526.08	4,194.46	25,488.07	30,208.61	230,413.77	243,104.29	5,822.00	2,204.00	8,026.00
Oregon	4,444	420,936.59	397,374.01	484,192.593		54,619.91	176,597.40	231,217.31	14,018.82	256,978.91	38,652.76	21,816.29	59,969.05
South Dakota	3,805	559,564.98	219,126.42	455,760.052	11,407.84	43,396.27	32,532.67	87,336.78	261,102.58	349,237.56	32,156.73	22,087.23	54,243.96
Utah	1,648	210,273.33	142,761.83	174,133.771	488.74	23,176.63	176,372.90	200,038.27	10,444.82	146,122.53	8,892.53	8,116.52	17,009.05
Washington	1,562	149,484.08	115,612.60	215,307.044	4,002.44	20,330.71	35,199.54	59,532.69	25,631.87	90,790.94	25,065.37	12,203.32	37,268.69
Wisconsin	118	2,377.32	4,375.04	7,932.830		918.72	710.00	1,628.72		1,816.74	1,747.90	22.20	1,770.10
Wyoming	10,389	2,252,018.59	473,617.40	538,218.796	154.73	186,449.74	255,078.33	441,682.80	8,230.02	481,966.04	36,000.00	25,429.51	61,429.51
Made at General Land Office	7		161.23			5.05	967.00	972.05					
Offices discontinued				10,911.289									
Total	83,079	11,365,818.38	7,074,758.60	10,777,001.349	51,488.74	1,146,339.57	1,506,089.45	2,703,917.69	1,387,781.74	4,204,844.65	457,889.82	337,094.89	794,984.62

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919—Continued.

RECAPITULATION BY CLASSES OF ENTRIES.

State or Territory.	At public auction.			Subject to preemption entry.			Timber and stone.			Mineral.			Coal.		
	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.
Alabama							13	680.32	$2,436.87						
Alaska										34	2,810.30	$8,405.00			
Arizona	5	512.95	$991.71				2	200.04	500.00	55	2,732.40	13,725.00			
Arkansas	13	540.00	1,300.00				19	1,487.69	7,539.21	2	60.00	150.00			
California	148	8,963.53	20,303.05				33	2,826.06	8,715.66	70	7,069.78	23,399.70			
Colorado	170	12,730.21	28,180.25	2	86.26	$107.82	35	3,700.94	11,541.14	60	1,649.51	7,082.50	5	414.40	$35,200.00
Florida	2	61.35	205.35				2	120.14	434.17						
Idaho	69	4,760.43	17,448.72				41	4,993.97	20,269.40	33	1,091.47	5,110.00			
Kansas	4	160.00	410.00												
Louisiana	4	127.70	996.97				10	959.88	4,272.40						
Michigan							34	1,878.15	5,360.32						
Minnesota	1	1.00	25.00				13	1,202.64	3,280.45						
Mississippi							27	1,246.31	4,694.88						
Missouri	2	136.35	170.44												
Montana	431	28,781.03	87,178.78				23	1,960.01	7,066.87	72	2,949.29	14,197.50	14	1,315.72	44,795.00
Nebraska	115	7,361.66	30,949.21												
Nevada	21	2,110.64	3,932.72							15	946.14	4,565.00			
New Mexico	124	8,627.42	17,155.28							15	631.56	3,185.00	2	200.00	5,160.00
North Dakota	6	182.44	1,685.60										2	120.00	2,400.00
Oklahoma	41	3,049.23	435.46							1	160.00	400.00			
Oregon	98	8,599.38	22,972.74				64	6,179.17	20,002.45	11	346.99	1,491.50			
South Dakota	68	3,714.23	11,902.76							5	893.54	2,712.50	2	120.00	1,200.00
Utah	10	959.16	2,178.35				1	84.06	377.50	38	2,717.80	9,420.00	15	2,992.10	150,328.80
Washington	92	5,464.91	16,406.32				8	879.51	3,167.75	13	689.08	2,535.00	2	240.00	4,800.00
Wisconsin							4	121.10	360.00						
Wyoming	117	7,877.53	18,027.22				17	2,161.01	5,676.41	9	1,091.52	2,783.50	18	1,997.99	181,280.15
Total	1,541	104,721.15	282,855.93	2	86.26	107.82	346	30,681.00	105,695.48	433	25,839.38	99,162.20	60	7,400.21	425,163.95

State.	Disposition of abandoned military reservations.											Excess area payments.		
	Homestead law.													
	Original.				Final.				Commuted.					
	No.	Acres.	Fees and commissions.	Purchase money.	No.	Acres.	Fees and commissions.	Purchase money.	No.	Acres.	Amount.	No.	Acres.	Amount.
Alabama												10	16.86	$21.27
Alaska												1	13.82	17.59
Arizona	2	240.00	$24.00		8	969.50	$16.00	$1,326.31				42	297.23	418.84
Arkansas												32	184.39	215.32
California												158	766.72	1,110.74
Colorado												468	1,975.17	2,486.00
Florida												17	57.23	71.62
Idaho												267	1,184.38	1,501.83
Kansas												6	27.32	65.40
Louisiana												9	36.42	46.17
Michigan												2	27.60	34.50
Mississippi												12	65.05	81.48
Montana	46	7,239.29	697.47	$2,647.71	3	443.86	5.34	553.03	34	5,323.57	$14,122.56	394	2,391.20	3,523.25
Nebraska					33	5,104.54	127.04	6,241.34				5	12.79	16.01
Nevada												36	238.58	317.50
New Mexico												353	2,200.81	2,838.66
North Dakota												24	161.14	214.00
Oregon												112	531.03	717.93
South Dakota						20.00		200.00				88	366.96	418.56
Utah												56	237.38	300.71
Washington												29	132.28	252.71
Wyoming												560	2,368.43	3,103.86
Total	48	7,509.29	721.47	2,647.71	44	6,537.90	148.38	8,320.68	34	5,323.57	14,122.56	2,621	13,292.79	17,833.86

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919—Continued.

RECAPITULATION BY CLASSES OF ENTRIES—Continued.

State.	Desert-land entries.																
	Number.		Acres.		Amount.		Desert-land relief, act of Mar. 4, 1915.										
							Elections to purchase.			Final.			Commuted.			Proof in the manner required of a homestead entryman.	
	Original.	Final.	Original.	Final.	Original.	Final.	No.	Acres.	Amount.	No.	Acres.	Amount.	No.	Acres.	Amount.	No.	Acres.
Arizona	169	64	27,701.70	10,993.37	$86,966.17	$10,985.91	77	15,286.64	$7,645.40	44	7,919.51	$5,869.00	1	160.00	$200.00	20	4,184.03
California	197	66	30,381.93	9,417.17	7,596.72	9,416.64	143	30,190.68	15,095.63	35	5,688.15	4,267.13				8	1,358.01
Colorado	85	54	14,535.13	8,332.83	3,634.44	8,354.46	190	35,474.79	17,738.82	168	32,409.08	24,308.53				25	4,621.10
Idaho	130	133	17,234.28	17,658.93	4,310.17	17,659.58	63	9,218.25	4,609.78	16	2,256.75	1,694.16	1	160.00	200.00	6	1,232.07
Montana	66	155	10,869.84	29,380.35	2,717.60	29,408.82	162	27,209.27	13,599.66	206	34,552.51	25,920.09				23	4,340.84
Nevada	56	25	9,714.77	4,354.73	2,430.17	4,520.27	2	640.00	320.00	3	640.00	480.00				2	485.56
New Mexico	13	15	1,920.00	2,018.42	480.00	2,017.86	41	6,861.77	3,430.92	24	4,295.74	3,382.77				7	960.00
Oregon	13	29	1,757.57	3,802.44	439.58	3,804.50	38	6,426.73	3,213.38	31	6,032.99	4,524.74				2	480.00
South Dakota		1		320.00		320.00	18	2,357.54	1,178.78	63	9,404.23	7,053.30				9	1,695.30
Utah	77	65	9,791.03	8,895.95	2,472.86	8,906.38	13	2,641.09	1,320.58	9	1,800.00	1,350.00				1	320.00
Washington	9	8	878.00	360.32	219.50	360.32	53	6,828.01	3,415.31	7	1,036.96	777.75				8	1,040.00
Wyoming	144	99	25,648.50	14,212.39	6,415.84	14,260.91	54	9,167.33	4,623.77	62	10,006.54	7,465.90				7	885.12
Total	959	714	150,435.75	109,746.90	37,677.05	109,989.65	854	152,302.10	76,192.03	668	116,043.76	87,084.37	2	320.00	400.00	118	21,602.03

State.	Homestead entries.									State selections.			Railroad selections.		
	Entries.			Acres.			Amount.								
	Original.	Final.	Commuted.	Original.	Final.	Commuted.	Original.	Final.	Commuted.	No.	Acres.	Amount.	No.	Acres.	Amount.
Alabama	161	158	20	14,438.87	12,444.70	1,359.62	$1,471.45	$310.80	$1,699.61						
Alaska	41	54		6,475.73	7,026.90		627.92	409.38							
Arizona	1,020	794	44	226,317.17	122,054.35	5,849.13	18,767.69	5,422.17	7,359.06	512	256,056.66	$1,663.00	7	849.50	$16.00
Arkansas	952	1,033	93	78,787.28	90,930.44	8,265.11	8,240.23	2,312.17	10,319.68						
California	2,028	1,613	79	417,724.59	220,907.90	10,123.45	37,133.43	10,928.53	14,340.06				8	72,345.16	912.00
Colorado	5,823	4,918	68	1,577,530.64	1,201,370.88	8,403.53	115,778.40	49,016.95	10,714.44	3	720.00	12.00	1	13,519.39	170.00
Florida	222	275	51	20,977.97	28,823.44	4,496.68	2,166.81	729.92	5,601.11	3	47.86	6.00			
Idaho	2,925	2,676	57	611,128.33	460,964.99	6,472.34	50,237.91	17,620.53	8,066.30	46	23,031.73	306.00	9	719.94	20.00
Kansas	223	345	5	47,739.47	66,332.01	559.77	3,634.79	2,285.15	900.00						
Louisiana	106	107	29	7,222.03	7,319.71	2,086.95	863.92	226.62	2,607.15	1	225.85	4.00			
Michigan	77	50	11	7,222.50	3,945.48	949.94	720.07	102.50	1,182.90						
Minnesota	192	346	18	19,567.71	33,074.40	927.64	1,968.99	913.50	1,209.57				4	114.57	8.00
Mississippi	106	127	16	7,808.98	8,413.69	804.03	862.34	211.58	1,010.62						
Missouri	6	21		400.00	1,381.18		45.00	35.13							
Montana	5,462	8,725	115	1,314,235.27	1,991,702.83	13,451.90	111,507.20	93,296.37	17,468.20	59	129,371.64	1,638.00	55	157,679.19	2,624.00
Nebraska	314	582	21	47,614.90	206,829.30	1,946.29	3,839.78	2,243.16	2,607.36						
Nevada	267	176	6	54,059.04	22,890.83	640.23	4,623.09	1,378.38	800.30	1	40.00	2.00	2	228,899.77	2,862.00
New Mexico	6,091	2,904	35	2,154,258.19	628,961.27	4,891.47	140,224.04	23,876.55	6,121.70	167	46,160.14	336.00	5	1,040.16	17.00
North Dakota	545	1,027	11	71,845.18	165,174.68	721.10	6,708.70	5,554.39	1,148.83						
Oklahoma	274	140	44	30,448.30	18,570.75	4,283.54	2,719.30	464.70	6,902.09						
Oregon	1,977	1,996	32	406,053.90	361,526.27	4,175.15	34,644.96	14,226.17	5,586.41				11	596.85	22.00
South Dakota	2,189	1,306	38	559,561.98	197,963.30	4,995.82	34,136.17	4,984.21	3,809.65						
Utah	637	551	6	171,799.49	124,157.31*	835.42	14,001.40	5,481.19	1,044.30	41	28,362.81	372.00			
Washington	576	731	23	122,001.26	102,972.81	2,628.31	12,129.97	5,233.51	3,928.79				18	26,444.82	414.00
Wisconsin	44	61	4	2,497.32	3,695.20	160.00	329.66	133.85	200.00				1	80.00	2.00
Wyoming	7,083	1,907	15	2,226,249.84	432,265.03	2,050.55	163,848.85	17,296.45	2,563.19	4	120.25	8.00			
Commissions on Indian lands							37,658.23	11,112.01							
Total	39,341	32,623	841	10,203,965.94	6,524,759.68	91,057.97	808,830.30	275,805.87	117,191.37	837	484,136.94	4,347.00	121	502,289.35	6,467.00

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1919—Continued.

RECAPITULATION BY CLASSES OF ENTRIES—Continued.

State.	Applications.						Mineral adverse claims.		Filings.								Fees.		Miscellaneous entries, applications, sales, etc.		
	Coal land.		Timber and stone land.		Mineral land.				Preemption.		Homestead.		Coal land.		Reservoir.		Cancellations.	Received for reducing testimony to writing, etc.			
	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.			No.	Acres.	Amount.
Alabama			5	$50													$6	$922.60	10	2,919.56	$112.22
Alaska					26	$260												213.43	61	1,419.63	3,291.88
Arizona					74	740	2	$20							1	$3	48	1,824.50	56	1,800.00	1,353.37
Arkansas			13	130	3	30					2	$4					41	2,538.19	8	1,234.65	810.46
California	9	$90	13	130	57	570	2	20			2	6	1	$3			101	5,821.76	19	374.84	3,049.70
Colorado	8	80	19	190	52	520	3	30	65	$195	8	24	39	117	1	3	234	13,197.66			
Florida											1	2					19	1,358.05	1	120.19	300.48
Idaho	1	10	18	180	31	310	2	20			2	6	4	12			72	5,537.07	28	200.00	8,451.91
Kansas											5	10					11	725.08			
Louisiana			5	50													5	2,201.65	21	7,831.05	1,291.75
Michigan			2	20													2	530.29			
Minnesota																	55	1,934.75			14,525.86
Mississippi			12	120													4	1,450.55	11	2,309.07	
Missouri																		242.20	20	1,132.02	1,415.67
Montana	21	210	7	70	56	560	5	50	3	9	8	24	60	180	4	12	254	19,129.35	31	51.39	1,587.66
Nebraska																	29	2,736.47			50.00
Nevada					11	110	4	40					8	24			4	725.65	7	200.00	395.00
New Mexico	2	20			5	50							3	9	18	54	93	5,890.22	79	8,938.64	3,948.00
North Dakota	14	140											4	8			31	2,552.29			
Oklahoma					1	10					1	2					25	921.94	10	1,415.58	17,802.04
Oregon	3	30	18	180	9	90					6	18	1	3			47	4,973.09	31	15,759.89	117,443.24
South Dakota	1	10			3	30					4	8	1	2			130	4,095.89	27		4,915.90
Utah	43	430			47	470	8	80					40	120			27	2,189.04	3	320.00	6.00
Washington	3	30	4	40	9	90					1	3	9	27			22	2,341.23	12	460.70	3,051.40
Wisconsin			1	10													5	438.21	3	398.74	150.00
Wyoming	17	170	1	10	9	90					13	39	105	315	1	3	105	4,564.44	201	1,069.72	13,441.35
Made at General Land Office																			7	164.23	972.05
Commissions on Indian lands																					2,718.50
Total	122	1,220	118	1,180	393	3,930	26	260	68	204	53	146	275	820	25	75	1,370	89,055.60	646	48,119.90	201,084.44

VACANT PUBLIC LANDS ON JULY 1, 1919.

Statement showing the area of land unappropriated and unreserved on July 1, 1919.

[Counties containing no unappropriated lands are omitted.]

ALABAMA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Montgomery:				
Autauga	160		160	Sandy, pine.
Baldwin	3,000		3,000	Rolling, pine, sandy.
Barbour	80		80	Broken, pine.
Calhoun	200		200	Broken, hilly, rolling.
Cherokee	2,200		2,200	[1] Do.
Chilton	360		360	Pine, broken, rolling.
Choctaw	600		600	Do.
Clark	340		340	Do.
Clay	1,080		1,080	Hilly, broken, pine.
Cleburne	2,480		2,480	Do.
Colbert	120		120	Do.
Conecuh	240		240	Level, pine, sandy.
Coosa	640		640	Pine lands, rolling.
Covington	480		480	Level, pine lands.
Crenshaw	160		160	Broken, rolling, pine.
Dale	340		340	Do.
Dekalb	320		320	Do.
Escambia	160		160	Level pine lands, rolling.
Etowah	280		280	Broken, rocky, hilly.
Fayette	3,000		3,000	Broken, hilly, pine.
Franklin	640		640	Do.
Geneva	160		160	Level, pine, sandy.
Green	80		80	Broken pine.
Houston	240		240	Level, pine, sandy.
Jackson	2,440		2,440	Broken, rolling, pine.
Lamar	560		560	Do.
Lauderdale	1,400		1,400	Level, pine, broken.
Madison	5,240		5,240	Broken, mountainous, pine.
Marion	1,800		1,800	Hilly, broken, pine.
Marshall	600		600	Level, pine lands.
Mobile	200		200	Level, pine, broken.
Monroe	200		200	Broken, hilly, rolling.
Morgan	1,120		1,120	Do.
Perry	40		40	Level, pine.
Pickens	260		260	Broken, hilly, rolling, pine.
Pike	200		200	Level, pine.
St. Clair	200		200	Broken, hilly, rolling, pine.
Shelby	200		200	Broken, rolling, pine.
Sumter	80		80	Level, broken, pine.
Talladega	800		800	Broken, hilly, pine.
Tuscaloosa	4,120		4,120	Do.
Walker	200		200	Broken, rolling, pine.
Washington	680		680	Do.
Winston	40		40	Do.
State total	37,740		37,740	

[1] "Do." is an abbreviation of the word "ditto" which means "the same."

ARIZONA.

Phoenix:				
Apache	528,033		528,033	Mountainous, arid, timber.
Cochise	396,939	345,747	742,686	Mountainous, grazing.
Coconino	330,168	8,283	338,451	Mountainous, grazing, timber.
Gila	35,718	100,000	135,718	Arid, broken.
Graham	352,483	568,698	921,181	Mountainous, grazing, broken.
Greenlee	99,372	263,000	362,372	Do.
Maricopa	962,346	2,050,438	3,012,784	Arid, grazing, broken.
Mohave	1,404,720	2,789,100	4,193,820	Do.
Navajo	332,640	133,750	466,390	Do.
Pima	646,859	1,373,000	2,019,859	Mountainous, arid, grazing.
Pinal	683,085	887,400	1,570,485	Arid, grazing.
Santa Cruz	52,562	46,080	98,642	Mountainous, arid, grazing.
Yavapai	532,606	1,285,642	1,818,248	Mountainous, grazing, broken.
Yuma	785,034	3,721,082	4,506,116	Arid, grazing, broken.
State total	7,142,565	13,572,220	20,714,785	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

ARKANSAS.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Camden:				
Ashley	15		15	Almost all on river.
Bradley	47		47	Swampy.
Calhoun	192		192	Do.
Clark	40		40	Broken.
Cleveland	14		14	On river.
Columbia	167		167	Low wet land.
Drew	42		42	Gently rolling.
Garland	6,344		6,344	Mountainous.
Hempstead	2		2	On river.
Hot Spring	2,404		2,404	Mountainous.
Howard	2,157		2,157	Do.
La Fayette	44		44	Low wet land.
Little River	102		102	River land.
Miller	296		296	Low wet land.
Montgomery	13,112		13,112	Mountainous.
Nevada	40		40	In bayou bottom.
Ouachita	82		82	River land.
Pike	3,674		3,674	Mountainous.
Polk	9,741		9,741	Do.
Saline	284		284	Do.
Sevier	864		864	Do.
Union	13		13	River or creek land.
Total	39,676		39,676	
Harrison:				
Baxter	17,120		17,120	Mountainous, timbered, mineral.
Benton	1,080		1,080	Mountainous, timbered.
Boone	2,760		2,760	Mountainous, timbered, mineral.
Carroll	1,600		1,600	Mountainous, timbered.
Crawford	320		320	Do.
Franklin	1,000		1,000	Do.
Fulton	11,200		11,200	Do.
Independence	560		560	Do.
Izard	12,800		12,800	Do.
Johnson	440		440	Do.
Madison	6,240		6,240	Do.
Marion	9,500		9,500	Mountainous, timbered, mineral.
Newton	14,140		14,140	Do.
Searcy	8,480		8,480	Mountainous, timbered.
Stone	23,800		23,800	Do.
Van Buren	680		680	Do.
Washington	6,960		6,960	Do.
Total	118,680		118,680	
Little Rock:				
Arkansas	129		129	Level.
Cleburne	12,591		12,591	Mountainous, timbered.
Cleveland	35		35	Broken, timbered.
Conway	1,594		1,594	Mountainous, timbered.
Crawford	5,800		5,800	Do.
Cross	40		40	Swampy, timbered.
Dallas	40		40	Do.
Desha	40		40	Do.
Drew	80		80	Do.
Faulkner	560		560	Broken, timbered.
Franklin	3,540		3,540	Broken, mountainous, timbered.
Fulton	4,320		4,320	Broken, timbered.
Garland	2,855		2,855	Broken, mountainous, timbered.
Grant	80		80	Broken, timbered.
Hot Springs	40		40	Do.
Independence	4,781		4,781	Do.
Izard	3,920		3,920	Do.
Jackson	240		240	Do.
Johnson	11,680		11,680	Broken, mountainous, timbered.
Lawrence	460		460	Broken, timbered.
Lincoln	160		160	Swampy, timbered.
Logan	6,960		6,960	Broken, timbered.
Mississippi	77	7,000	7,077	Do.
Montgomery	140		140	Do.
Perry	790		790	Do.
Pope	5,640		5,640	Do.
Prairie	80		80	Level.
Pulaski	181		181	Broken, timbered.
Randolph	4,640		4,640	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

ARKANSAS—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Little Rock—Continued.				
Saline	1,190		1,190	Broken, mountainous, timbered.
Scott	17,440		17,440	Do.
Sebastian	2,320		2,320	Do.
Sharp	9,960		9,960	Do.
Van Buren	36,560		36,560	Broken, timbered.
White	440		440	Do.
Yell	2,840		2,840	Do.
Total	142,243	7,000	149,243	
State total	300,599	7,000	307,599	

CALIFORNIA.

El Centro:				
Imperial	992,270	510,005	1,502,275	Level, rolling, mountainous, all desert.
Riverside	939,559	827,397	1,766,956	Do.
San Diego	347,198	60,680	407,878	Do.
Total	2,279,027	1,398,082	3,677,109	
Eureka:				
Del Norte	560		560	Sea beach, mountainous.
Humboldt	57,460	16,851	74,311	Mountainous, timber, and grazing.
Mendocino	4,680		4,680	Mountainous, grazing.
Siskiyou	2,270		2,270	Forest listing, grazing, farming.
Trinity	21,880		21,880	Mineral, grazing, farming.
Total	86,850	16,851	103,701	
Independence:				
Alpine	10,581		10,581	Mountainous, grazing, and mineral.
Inyo	2,686,210	1,175,838	3,862,048	Mountainous, desert, grazing, and agricultural.
Kern	600,397	124,760	725,157	Grazing, mineral, and agricultural.
Mono	271,507	42,724	314,231	Mountainous, grazing, and agricultural.
San Bernardino	2,094,135	1,213,515	3,307,650	Mountainous, mineral, and desert.
Tulare	55,075		55,075	Mountainous and grazing.
Total	5,717,905	2,556,837	8,274,742	
Los Angeles:				
Kern	30,066	5,393	35,459	Arid, level desert, mountainous.
Los Angeles	489,444	5,916	495,360	Do.
Orange	19,726	1,624	21,350	Mountainous, hilly.
Riverside	196,516	42,865	239,381	Mountainous, rolling, level desert.
San Bernardino	3,303,705	309,844	3,613,549	Do.
San Diego	94,149	2,240	96,389	Do.
Santa Barbara	1,180		1,180	Mountainous.
Ventura	36,184	9,410	45,594	Do.
Total	4,170,970	377,292	4,548,262	
Sacramento:				
Alpine	12,435	300	12,735	Do.
Amador	12,600		12,600	Hilly, grazing, mineral.
Butte	21,500	320	21,820	Do.
Calaveras	42,637		42,637	Do.
Colusa	24,326	1,880	26,206	Hilly, grazing.
El Dorado	32,357		32,357	Hilly, grazing, mineral.
Fresno	5,720	1,380	7,100	Do.
Glenn	11,943		11,943	Do.
Lake	11,187		11,187	Do.
Madera	5,853	1,400	7,253	Do.
Mariposa	43,493		43,493	Do.
Merced	1,187		1,187	Do.
Modoc	853	4,360	5,213	Do.
Napa	21,567		21,567	Do.
Nevada	39,196		39,196	Do.
Placer	17,408		17,408	Do.
Plumas	145		145	Do.
Shasta	167,147	2,160	169,307	Do.
Siskiyou	81,328	32,067	113,395	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

CALIFORNIA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Sacramento—Continued.				
Stanislaus	11,273	.....	11,273	Hilly, grazing, mineral.
Sutter	240	.....	240	Do.
Tehama	61,752	2,000	63,752	Do.
Trinity	28,414	4,700	33,114	Mountainous, mineral.
Tuolumne	18,417	1,600	20,017	Hilly, grazing, mineral.
Yolo	24,122	.....	24,122	Do.
Yuba	5,950	.....	5,950	Do.
Total	703,050	52,167	755,217	
San Francisco:				
Alameda	814	1,280	2,094	Mountainous.
Colusa	11,566	.....	11,566	Do.
Contra Costa	1,300	.....	1,300	Do.
Fresno	39,858	3,862	43,720	Do.
Glenn	1,920	.....	1,920	Do.
Kern	16,839	640	17,479	Do.
Kings	928	.....	928	Do.
Lake	139,986	8,060	148,046	Do.
Mendocino	181,630	5,760	187,390	Do.
Merced	5,642	.....	5,642	Do.
Monterey	182,922	2,560	185,482	Do.
Napa	40,911	.....	40,911	Do.
San Benito	160,427	8,960	169,387	Do.
San Joaquin	1,060	.....	1,060	Do.
San Luis Obispo	170,324	2,473	172,797	Do.
Santa Barbara	13,738	.....	13,738	Do.
Santa Clara	43,319	3,660	46,979	Do.
Santa Cruz	206	.....	206	Do.
Solano	2,056	.....	2,056	Do.
Sonoma	38,735	4,640	43,375	Do.
Stanislaus	19,164	2,600	21,764	Do.
Ventura	2,286	.....	2,286	Do.
Yolo	6,400	640	7,040	Do.
Total	1,082,031	45,135	1,127,166	
Susanville:				
Lassen	1,002,520	24,521	1,027,041	Grazing, desert, timber, mineral.
Modoc	264,082	16,840	280,922	Do.
Plumas	7,948	2,591	10,539	Mountainous, timber, mineral.
Sierra	5,263	.....	5,263	Do.
Total	1,279,813	43,952	1,323,765	
Visalia:				
Fresno	125,095	2,814	127,909	Mountainous, grazing.
Kern	139,663	26,724	166,387	Do.
Kings	15,459	.....	15,459	Do.
Merced	8,361	.....	8,361	Do.
Monterey	1,447	.....	1,447	Do.
San Benito	6,325	.....	6,325	Do.
Tulare	38,409	65,768	104,177	Do.
Total	334,759	95,306	430,065	
State total	15,654,405	4,585,572	20,239,977	

COLORADO.

Del Norte:				
Alamosa	46,279	3,840	50,119	Grazing.
Chaffee	2,597	.....	2,597	Do.
Conejos	163,033	.....	163,033	Do.
Huerfano	5,168	3,840	9,008	Do.
Las Animas	.....	29,440	29,440	Do.
Rio Grande	63,587	.....	63,587	Do.
Saguache	293,508	.....	293,508	Do.
Total	574,172	37,120	611,292	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

COLORADO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Denver:				
Adams	40		40	Agricultural, grazing.
Arapahoe	80		80	Do.
Boulder	680		680	Mountainous, mineral.
Clear Creek	4,800	13,440	18,240	Do.
Douglas	1,560		1,560	Arid, grazing, mineral.
Eagle	11,700		11,700	Mountainous, grazing, mineral.
Elbert	360		360	Agricultural, grazing.
Gilpin	6,440	3,840	10,280	Mountainous, grazing, mineral.
Grand	109,520	13,860	123,380	Mountainous, grazing.
Jackson	236,480		236,480	Do.
Jefferson	8,320		8,320	Do.
Larimer	43,780		43,780	Do.
Morgan	520		520	Agricultural, grazing.
Routt		7,680	7,680	Mountainous, grazing, mineral.
Summit	6,680	4,630	11,310	Do.
Weld	720		720	Agricultural, grazing.
Total	431,680	43,450	475,130	
Durango:				
Archuleta	70,689	57,416	128,105	Agriculture, timber, grazing.
Dolores	45,266	7,520	52,786	Mountainous, agricultural, mineral, grazing.
La Plata	128,607	10,160	138,767	Grazing, agricultural, mineral.
Montezuma	263,864	57,520	321,384	Do.
Total	508,426	132,616	641,042	
Glenwood Springs:				
Eagle	35,542	234,189	269,731	Farming, grazing, mineral.
Garfield	755,625	196,151	951,776	Do.
Gunnison	440	7,840	8,280	Do.
Mesa	114,860	31,480	146,340	Do.
Moffat	1,314,996	234,423	1,549,419	Do.
Pitkin	27,120	24,320	51,440	Grazing and mineral.
Rio Blanco	1,170,183	148,366	1,318,549	Farming and grazing.
Routt	124,663	121,631	246,294	Farming, grazing, mineral.
Total	3,543,429	998,400	4,541,829	
Hugo:				
Cheyenne	275		275	Prairie, farming, and grazing.
Kit Carson	4,475		4,475	Do.
Lincoln	1,093		1,093	Do.
Total	5,843		5,843	
Lamar:				
Baca	24,176		24,176	Grazing, farm, prairie, hilly.
Bent	24,131		24,131	Grazing, broken, hilly, prairie.
Cheyenne	329		329	Prairie, grazing.
Kiowa	633		633	Grazing, rolling, prairie.
Las Animas	26,440		26,440	Grazing, broken, hilly.
Lincoln	200		200	Grazing.
Prowers	6,113		6,113	Grazing, prairie, hilly.
Total	82,022		82,022	
Leadville:				
Chaffee	68,122		68,122	Grazing, agricultural, mineral, mountainous.
Fremont	36,164		36,164	Grazing, agricultural, mineral.
Lake	8,222		8,222	Grazing, mountainous, mineral.
Park	209,327	4,000	213,327	Grazing, agricultural, mineral.
Summit	465		465	Grazing, mountainous, mineral.
Teller	7,857		7,857	Grazing, agricultural.
Total	330,157	4,000	334,157	
Montrose:				
Delta	186,740	55,560	242,300	Mountainous, coal, grazing, farming.
Dolores	27,373	3,780	31,153	Mineral, grazing, arid.
Gunnison	451,716	89,040	540,756	Grazing, mountainous, coal, mineral, farming.
Hinsdale	104,010	11,200	115,210	Grazing, mountainous, mineral, timber, coal.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

COLORADO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Montrose—Continued.				
Mesa	618,928	181,683	800,611	Coal, farming, mineral, grazing.
Montrose	468,564	155,123	623,687	Do.
Ouray	23,206		23,206	Farming, grazing, mineral, mountainous.
Saguache	126,300		126,300	Farming, grazing, mineral, timber.
San Miguel	238,387	73,100	311,487	Farming, grazing, coal, rich mineral.
Total	2,245,224	559,386	2,804,610	
Pueblo:				
Alamosa	11,320		11,320	Mountainous.
Bent	2,742		2,742	Agricultural, grazing.
Crowley	340	7,140	7,480	Do.
Custer	11,478		11,478	Mountainous, grazing.
El Paso	600	1,320	1,920	Mountainous, grazing, agricultural.
Fremont	333,040		333,040	Do.
Huerfano	53,880		53,880	Do.
Kiowa		680	680	Grazing, agricultural.
Las Animas	51,757		51,757	Mountainous, agricultural, grazing.
Lincoln		720	720	Grazing, agricultural.
Otero	10,877		10,877	Do.
Pueblo	3,240		3,240	Agricultural, mountainous, grazing.
Saguache	21,760		21,760	Mountainous.
Teller	23,188		23,188	Largely mineral, mountainous, grazing.
Total	524,222	9,860	534,082	
Sterling:				
Logan	480	4,280	4,760	Sandy, grazing, agricultural.
Morgan	999	152	1,151	Sandy, grazing.
Phillips	320		320	Do.
Sedgwick	120		120	Do.
Washington	1,240		1,240	Do.
Weld	1,008	10,937	11,945	Sandy, grazing, agricultural.
Yuma	1,955	480	2,435	Sandy, grazing.
Total	6,122	15,849	21,971	
State total	8,251,297	1,296,681	9,547,978	

FLORIDA.

Gainesville:				
Alachua	1,020		1,020	Low, pine.
Baker	360		360	Do.
Bay	4,996		4,996	Do.
Bradford	931		931	Do.
Brevard	15,240		15,240	Low, pine, swamp.
Calhoun	1,000		1,000	Low, pine.
Citrus	2,663		2,663	Do.
Clay	1,523		1,523	Do.
Columbia	634		634	Do.
De Soto	5,783		5,783	Do.
Escambia	1,282		1,282	Do.
Gadsden	423		423	Do.
Hamilton	768		768	Do.
Hernando	520		520	Do.
Holmes	237		237	Do.
Jackson	267		267	Do.
Jefferson	163		163	Do.
La Fayette	5,371		5,371	Low, pine, swamp.
Lake	16,943		16,943	Low, pine.
Lee	7,650		7,650	Low, pine, swamp.
Leon	80		80	Low, pine.
Levy	3,994		3,994	Do.
Liberty	697		697	Do.
Madison	725		725	Do.
Manatee	873		873	Do.
Marion	6,333		6,333	Do.
Monroe	1,718		1,718	Low, pine, swamp.
Nassau	462		462	Low, pine.
Okaloosa	280		280	Do.
Orange	1,405		1,405	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

FLORIDA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Gainesville—Continued.				
Osceola	378		378	Low, pine.
Pasco	400		400	Do.
Polk	1,564		1,564	Do.
Putnam	6,822		6,822	Do.
St. Johns	1,356		1,356	Do.
St. Lucie	605		605	Do.
Santa Rosa	359		359	Do.
Seminole	586		586	Do.
Sumter	240		240	Do.
Suwannee	494		494	Do.
Taylor	2,560		2,560	Do.
Volusia	8,968		8,968	Do.
Wakulla	400		400	Do.
Walton	6,455		6,455	Do.
Washington	2,256		2,256	Do.
State total	117,784		117,784	

IDAHO.

Blackfoot:				
Bannock	88,520	16,560	105,080	Mountainous.
Bear Lake	28,400	22,500	50,900	Do.
Bingham	273,070	56,920	329,990	Dry farming.
Booneville	23,160	31,360	54,520	Dry farming and grazing.
Butte	94,200	45,000	139,200	Do.
Caribou	11,840		11,840	Mountainous.
Clark	220,810	96,040	316,850	Dry farming.
Franklin	6,900		6,900	Mountainous.
Fremont	62,280		62,280	Dry farming.
Jefferson	189,740	73,680	263,420	Do.
Lemhi		1,920	1,920	Mountainous.
Madison	3,240	8,960	12,200	Do.
Oneida	95,200	39,040	134,240	Do.
Power	62,900		62,900	Do.
Teton	880	2,000	2,880	Do.
Total	1,161,140	393,980	1,555,120	
Boise:				
Ada	139,252		139,252	Arid and mountainous.
Adams	43,240		43,240	Mountainous, grazing, timber.
Boise	110,186	7,680	117,866	Mountainous, mineral, grazing, timber.
Canyon	22,990		22,990	Arid and grazing.
Elmore	122,933	25,280	148,213	Arid, mountainous, mineral, grazing, timber.
Gem	40,638	7,680	48,318	Arid, mountainous, grazing, timber.
Idaho	28,920	136,850	165,770	Arid, mountainous, grazing, mineral, timber.
Owyhee	2,160,323	1,225,820	3,386,143	Do.
Payette	47,190		47,190	Arid, mountainous, grazing.
Valley	107,088	395,000	502,088	Arid, mountainous, mineral, grazing, timber.
Washington	140,047	7,680	147,727	Do.
Total	2,962,807	1,805,990	4,763,797	
Coeur d'Alene:				
Benewah	21,292		21,292	Agricultural, grazing, and timbered.
Bonner	19,321		19,321	Agricultural grazing, timbered, and mineral.
Boundary	6,625	7,040	13,665	Do.
Kootenai	17,596		17,596	Agricultural, grazing, and timbered.
Shoshone	67,893	10,240	78,133	Agricultural grazing, timbered, and mineral.
Total	132,727	17,280	150,007	
Hailey:				
Bingham		11,520	11,520	Lava and sagebrush plains, mountainous, grazing, sagebrush.
Blaine	235,230	400,000	635,230	Mountainous, grazing, sagebrush.
Butte	237,720	163,120	400,840	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

IDAHO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Hailey—Continued.				
Camas	99,120	18,640	117,760	Grazing, sagebrush, somewhat mountainous.
Cassia	228,341	27,520	255,861	Mountainous, grazing, sagebrush.
Custer	367,089	274,379	641,468	Do.
Elmore	16,953	14,720	31,673	Lava and sagebrush plains.
Gooding	136,711	14,720	151,431	Mountainous, grazing, sagebrush.
Lemhi	400,829	197,320	598,149	Lava and sagebrush plains.
Lincoln	187,731	142,720	330,451	Do.
Minidoka	60,500	103,200	163,700	Grazing and sagebrush plains.
Owyhee	145,814	77,862	223,676	Lava and sagebrush plains.
Power	38,305	80,640	118,945	Grazing and sagebrush plains.
Twin Falls	227,995	55,682	283,677	Mountainous, grazing, sagebrush.
Valley	17,679	143,454	161,133	Grazing and sagebrush plains.
Total	2,400,017	1,725,497	4,125,514	
Lewiston:				
Clearwater	26,567		26,567	Mountainous.
Idaho	38,873		38,873	Mountainous, grazing.
Latah	1,057		1,057	Mountainous.
Lewis	5,670		5,670	Mountainous, grazing.
Nez Perce	14,673		14,673	Do.
Shoshone	2,330		2,330	Mountainous.
Total	89,170		89,170	
State total	6,745,851	3,942,747	10,688,608	

LOUISIANA.

Baton Rouge:				
Acadia	6		6	Prairie.
Allen	122		122	Pine woods.
Ascension	59		59	Swampy.
Avoyelles	657		657	Prairie, pine woods.
Beauregard	80		80	Pine woods.
Bienville	387		387	High, pine woods.
Bossier	1,241		1,241	Do.
Caddo	289		289	Do.
Calcasieu	1,743		1,743	Prairie, pine woods.
Caldwell	3,814		3,814	High, pine woods.
Cameron	258		258	Prairie, marsh.
Catahoula	4,051		4,051	High, pine woods.
Claiborne	441		441	Pine woods.
Concordia	97		97	Alluvial.
De Soto	120		120	High, pine woods.
East Baton Rouge	20		20	Pine.
East Carroll	456		456	Low, pine woods.
East Feliciana	43		43	Pine woods.
Evangeline	40		40	Prairie, pine.
Franklin	50		50	Pine woods, hilly.
Grant	153		153	Do.
Iberia	961		961	Prairie, marsh.
Jackson	140		140	Pine woods, hilly.
Lafourche	289		289	Agricultural.
La Salle	215		215	Pine woods.
Lincoln	320		320	Agricultural.
Livingston	67		67	Hardwoods.
Madison	20		20	Low, pine woods.
Morehouse	205		205	Pine woods.
Natchitoches	391		391	Do.
Ouachita	679		679	Do.
Plaquemines	1,729		1,729	Prairie, marsh.
Pointe Coupee	323		323	Ordinary farming, swamp.
Rapides	226		226	Pine woods, agricultural.
Red River	10		10	Do.
Richland	308		308	Do.
Sabine	392		392	Do.
St. Charles	10		10	Do.
St. Helena	31		31	Pine woods.
St. James	243		243	Farming, swampy.
St. John	2,353		2,353	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

LOUISIANA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Baton Rouge—Continued.				
St. Landry	112		112	Prairie, pine woods.
St. Martin	720		720	Prairie, swampy.
St. Mary	640		640	Do.
St. Tammany	502		502	Pine woods.
Tangipahoa	38		38	Pine woods, swampy.
Tensas	18		18	Alluvial.
Terrebonne	3,101		3,101	Low, swampy.
Union	756		756	Pine woods, farming.
Vermilion	40		40	Prairie.
Vernon	322		322	Pine woods.
Washington	246		246	Pine woods, farming.
Webster	210		210	Pine woods.
West Feliciana	265		265	Pine woods, farming.
Winn	120		120	Do.
State total	30,129		30,129	

KANSAS.

Topeka:				
Barber	188		188	Broken, sandy.
Cheyenne	240		240	Rough and broken.
Clark	548		548	Broken, sandy.
Comanche	200		200	Do.
Edwards	131		131	Do.
Ellis	120		120	Rough and broken.
Gove	200		200	Do.
Greeley	132		132	Agricultural.
Hamilton	712		712	Broken, sandy.
Kearney	130		130	Do.
Kiowa	40		40	Do.
Lane	360		360	Grazing, broken.
Logan	40		40	Rough and broken.
Meade	136		136	Broken, sandy.
Morton	400		400	Do.
Osborne	40		40	Rough and broken.
Rollins	200		200	Do.
Scott	320		320	Grazing, broken.
Seward	320		320	Broken, sandy.
Sherman	42		42	Rough and broken.
Stafford	41		41	Swampy.
Stanton	40		40	Grazing, broken.
Stevens	256		256	Broken, sandy.
Trego	40		40	Rough and broken.
Wichita	80		80	Grazing, broken.
State total	4,956		4,956	

MICHIGAN.

Marquette:				
Alcona	633		633	Light soil.
Alger	1,933		1,933	Fair farming.
Alpena	160		160	Do.
Antrim	160		160	Do.
Baraga	3,690		3,690	Do.
Benzie	249		249	Do.
Charlevoix	1,213		1,213	Do.
Cheboygan	783		783	Do.
Chippewa	9,512		9,512	Timbered.
Clare	666		666	Fair farming.
Crawford	760		760	Do.
Delta	5,223		5,223	Do.
Dickinson	800		800	Do.
Emmitt	164		164	Do.
Gladwin	80		80	Do.
Grand Traverse	462		462	Do.
Houghton	80		80	Do.
Iosco	500		500	Light soil.
Iron	596		596	Fair farming.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

MICHIGAN—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Marquette—Continued.				
Jackson	80		80	Wet.
Kalkaska	1,039		1,039	Light soil.
Keweenaw	11,366		11,366	Do.
Lake	160		160	Very light soil.
Leelanau	1,746		1,746	Fair farming.
Luce	3,249		3,249	Fair farming, some timber.
Mackinac	1,843		1,843	Fair farming.
Marquette	6,892		6,892	Timbered, farming.
Mason	30		30	Fair farming.
Mecosta	80		80	Do.
Menominee	760		760	Do.
Missaukee	280		280	Do.
Montmorency	1,844		1,844	Do.
Muskegon	120		120	Do.
Oakland	40		40	Wet.
Oceana	704		704	Very sandy.
Ogemaw	220		220	Sandy, light soil.
Ontonagon	340		340	Timbered, farming.
Oscoda	1,845		1,845	Light soil.
Otsego	596		596	Fair farming.
Presque Isle	1,280		1,280	Do.
Roscommon	320		320	Do.
Schoolcraft	10,608		10,608	Do.
State total	73,106		73,106	

MINNESOTA.

Cass Lake:				
Beltrami	1,200		1,200	Swampy.
Cass	1,380		1,380	Do.
Hubbard	80		80	Do.
Itasca	1,400		1,400	Timbered, agricultural.
Koochiching	67,340		67,340	Timbered, agricultural, swampy.
Total	71,400		71,400	
Crookston:				
Beltrami	108,376		108,376	Swamp, some timber.
Clearwater	840		840	Swamp, cut-over land.
Roseau	10,887		10,887	Swamp, some timber.
Total	120,103		120,103	
Duluth:				
Aitkin	440		440	Low, wet.
Carlton	160		160	Swamp.
Cass	440		440	Low, wet, sandy.
Cook	8,600		8,600	Broken, rough, swamp.
Crow Wing	39		39	Fractional lots.
Hubbard	61		61	Broken, rough, swamp.
Itasca	600		600	Broken, rough.
Koochiching	19,720		19,720	Swamp, agricultural.
Lake	4,440		4,440	Rocky, broken, swamp.
Morrison	104		104	Lowlands.
Pine	200		200	Sandy low lands.
Pope	40		40	Swamp.
St. Louis	13,800		13,800	Broken, rough, swamp, agricultural.
Wabasha	40		40	Swamp.
Wadena	127		127	Sandy.
Total	48,811		48,811	
State total	240,314		240,314	

MISSISSIPPI.

Jackson:				
Adams	1,200		1,200	Agricultural, timbered.
Amite	400		400	Do.
Attala	1,540		1,540	Do.
Calhoun	40		40	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

MISSISSIPPI—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Jackson—Continued.				
Carroll	360		360	Agricultural, timbered.
Choctaw	240		240	Do.
Claiborne	1,806		1,806	Do.
Clarke	480		480	Do.
Copiah	680		680	Do.
Covington	120		120	Do.
Forrest	380		380	Pine woods, farming.
Franklin	957		957	Agricultural, timbered.
George	1,344		1,344	Pine belt, grazing.
Greene	3,640		3,640	Agricultural, timbered.
Grenada	1,400		1,400	Do.
Hancock	1,180		1,180	Do.
Harrison	200		200	Do.
Hinds	685		685	Do.
Holmes	100		100	Do.
Issaquena	70		70	Do.
Jackson	4,217		4,217	Do.
Jasper	800		800	Do.
Jefferson	1,900		1,900	Farming, some broken.
Jones	960		960	Agricultural, timbered.
Kemper	400		400	Do.
Lamar	80		80	Pine woods, farming.
Lauderdale	1,000		1,000	Pine belt, grazing.
Lawrence	240		240	Farming, timber, grazing.
Leake	480		480	Agricultural, timbered.
Lincoln	400		400	Farming, timber.
Lowndes	280		280	Farming.
Madison	80		80	Agricultural, timbered.
Marion	268		268	Level farming, grazing.
Monroe	1,154		1,154	Agricultural, timbered.
Montgomery	1,000		1,000	Do.
Neshoba	40		40	Do.
Newton	40		40	Do.
Noxubee	200		200	Do.
Oktibbeha	40		40	Farming.
Panola	80		80	Level farming.
Pearl River	500		500	Pine woods, farming.
Perry	1,080		1,080	Agricultural, timbered.
Pike	40		40	Do.
Quitman	40		40	Do.
Rankin	240		240	Do.
Scott	40		40	Do.
Simpson	160		160	Do.
Smith	200		200	Generally level, farming.
Stone	120		120	Agricultural.
Sunflower	12		12	Agricultural, timbered.
Tallahatchie	40		40	Level, farming.
Warren	760		760	Agricultural, timbered.
Wayne	2,600		2,600	Do.
Webster	1,200		1,200	Do.
Wilkinson	1,480		1,480	Do.
Winston	240		240	Do.
Yalobusha	680		680	Swampy, farming.
Yazoo	20		20	Agricultural, timbered.
State total	39,933		39,933	

MISSOURI.

Springfield:				
Barry	21		21	Rough and hilly.
Carter	9		9	Do.
Pemiscot	40		40	Swamp land.
Shannon	8		8	Rough and hilly.
State total	78		78	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

MONTANA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Billings:				
Big Horn	6,909	15,360	22,269	Mountainous grazing.
Carbon	68,585	149,366	217,951	Do.
Musselshell	3,725		3,725	Do.
Rosebud	951		951	Do.
Stillwater	891		891	Do.
Yellowstone	11,074		11,074	Do.
Total	92,135	164,726	256,861	
Bozeman:				
Beaverhead	21,306	47,520	68,826	Grazing and mountainous.
Broadwater	11,360		11,360	Do.
Carbon	7,632		7,632	Do.
Gallatin	18,844		18,844	Do.
Jefferson	8,786	8,723	17,509	Do.
Madison	74,187	31,607	105,794	Do.
Park	31,990	4,220	36,210	Do.
Stillwater	31,648		31,648	Do.
Sweet Grass	62,549	1,440	63,989	Do.
Total	268,302	93,510	361,812	
Glasgow:				
Garfield	39,200	21,760	60,960	Grazing or dry farming.
McCone	54,880		54,880	Do.
Phillips	275,880	184,960	460,840	Do.
Richland	6,126		6,126	Do.
Roosevelt	63,252		63,252	Do.
Sheridan	40,334		40,334	Do.
Valley	392,090	304,640	696,730	Do.
Total	871,762	511,360	1,383,122	
Great Falls:				
Cascade	21,002	1,440	22,442	Grazing, agricultural.
Choteau	21,585		21,585	Do.
Fergus	1,360		1,360	Do.
Glacier	1,069		1,069	Do.
Hill	2,720		2,720	Do.
Lewis and Clark	4,040		4,040	Grazing, agricultural, mountainous.
Powders	2,675		2,675	Do.
Teton	12,615	22,480	35,095	Do.
Toole	12,620		12,620	Do.
Total	79,686	23,920	103,606	
Havre:				
Blaine	55,825	300,742	356,567	Mountainous, agricultural, grazing.
Chouteau	15,200	63,153	78,353	Do.
Hill	55,804		55,804	Do.
Phillips	102,194	402,466	504,660	Do.
Toole	6,431	4,160	10,591	Do.
Total	235,454	770,521	1,005,975	
Helena:				
Beaverhead	287,820	267,900	555,720	Grazing.
Broadwater	22,200		22,200	Do.
Cascade	1,520		1,520	Do.
Deer Lodge	6,280		6,280	Do.
Jefferson	47,520	12,000	59,520	Do.
Lewis and Clark	53,340	180,000	233,340	Do.
Madison	105,760	45,750	151,510	Do.
Meagher	11,380	11,500	22,880	Do.
Powell	68,970	45,000	113,970	Do.
Silver Bow	25,240	4,800	30,040	Do.
Total	630,030	566,950	1,196,980	
Kalispell:				
Flathead	67,500		67,500	Mountainous, timber.
Lincoln	2,300		2,300	Agricultural, grazing.
Sanders	34,600		34,600	Mountainous, timber.
Teton	400		400	Grazing.
Total	104,800		104,800	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

MONTANA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Lewistown:				
Chouteau	7,360		7,360	Broken, grazing.
Dawson	167,080		167,080	Farming and grazing.
Fergus	272,920	27,120	300,040	Do.
Musselshell	8,460	19,200	27,660	Rough, grazing.
Rosebud	4,280		4,280	Do.
Sweet Grass	600		600	Do.
Wheatland	2,160		2,160	Do.
Total	462,860	46,320	509,180	
Miles City:				
Big Horn	57,492	15,700	73,192	Grazing, agricultural.
Carter	294,557	299,520	594,077	Do.
Custer	130,344		130,344	Do.
Dawson	26,284		26,284	Do.
Fallon	18,334		18,334	Do.
Garfield	301,020	138,240	439,260	Do.
McCone	23,800	67,200	91,000	Do.
Powder River	221,923		221,923	Do.
Prairie	30,508		30,508	Do.
Richland	3,720		3,720	Do.
Rosebud	156,857	52,900	209,757	Do.
Treasure	1,800		1,800	Do.
Wibaux	12,040		12,040	Do.
Total	1,278,679	573,560	1,852,239	
Missoula:				
Beaverhead	39,191	9,000	48,191	Arid, grazing.
Granite	22,133	93,180	115,313	Mountainous, timber, mineral.
Mineral	57,697		57,697	Do.
Missoula	13,261	37,636	50,897	Do.
Powell	19,947	25,880	45,827	Do.
Ravalli	2,223	388	2,611	Mountainous, timber, grazing.
Sanders	4,483	34,000	38,483	Mountainous, timber, mineral.
Total	158,935	200,084	359,019	
State total	4,182,643	2,950,951	7,133,594	

NEBRASKA.

Alliance:				
Arthur	120		120	Sand hill, grazing.
Banner	1,200		1,200	Prairie, table land.
Dawes	750		750	Rough, grazing.
Garden	1,840		1,840	Sand hill, grazing.
Grant	100		100	Do.
Morrill	7,680		7,680	Do.
Scottsbluff	14,860		14,860	Mountainous, agricultural.
Sheridan	4,095		4,095	Sand hill, grazing.
Sioux	6,360		6,360	Broken, grazing.
Total	37,005		37,005	
Broken Bow:				
Arthur	1,470		1,470	Sandy, grazing, small valleys.
Banner	80		80	Do.
Blaine	1,929		1,929	Do.
Brown	2,789		2,789	Do.
Cherry	23,820		23,820	Do.
Cheyenne	40		40	Do.
Custer	80		80	Do.
Garden	760		760	Do.
Grant	2,611		2,611	Do.
Hooker	6,628		6,628	Do.
Keith	120		120	Do.
Keya Paha	480		480	Do.
Kimball	200		200	Do.
Lincoln	1,070		1,070	Do.
Logan	320		320	Do.
McPherson	2,594		2,594	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

NEBRASKA—Continued.

Land district and county.	Area in acres. Surveyed.	Unsurveyed.	Total.	Character.
Broken Bow—Continued.				
Morrill	480		480	Sandy, grazing, small valleys.
Perkins	40		40	Do.
Rock	720		720	Do.
Thomas	3,993		3,993	Do.
Total	50,224		50,224	
Lincoln:				
Boone	160		160	Rough, sandy.
Boyd	608		608	Rough, overflowed bottom.
Brown	160		160	Rough, sandy.
Burt	242		242	Overflowed bottom.
Chase	199		199	Broken, sandy, grazing.
Dundy	240		240	Do.
Frontier	120		120	Do.
Garfield	501		501	Rough, sandy.
Hayes	719		719	Broken, grazing.
Hitchcock	482		482	Broken, sandy, grazing.
Holt	437		437	Rough, sandy.
Knox	253		253	Overflowed bottom.
Loup	775		775	Rough, sandy.
Red Willow	333		333	Broken, grazing.
Rock	160		160	Rough, sandy.
Sarpy	18		18	Overflowed bottom.
Washington	99		99	Do.
Webster	11		11	Do.
Wheeler	80		80	Rough, sandy.
Total	5,597		5,597	
State total	92,826		92,826	

NEVADA.

Carson City:				
Churchill	1,333,010	1,288,007	2,621,017	Mountainous, arid, grazing, little timber.
Clark	3,382,191	1,274,888	4,657,079	Do.
Douglass	184,124	4,402	188,526	Do.
Esmeralda	1,079,896	906,528	1,986,424	Do.
Eureka	18,201	40,071	58,272	Mountainous, arid, grazing.
Humboldt	2,599,459	3,707,797	6,307,256	Do.
Lander	103,456	26,793	130,249	Do.
Lincoln	2,112,859	3,935,444	6,048,303	Do.
Lyon	334,307	208,051	542,358	Do.
Mineral	1,225,534	648,308	1,873,842	Mountainous, arid, little timber.
Nye	3,386,335	5,481,048	8,867,383	Mountainous, arid, grazing, little timber.
Ormsby	24,225	19,980	44,205	Mountainous, arid, grazing, second growth timber.
Storey	97,910	1,272	99,182	Mountainous, arid, grazing.
Washoe	2,312,959	576,986	2,889,945	Mountainous, arid, grazing, second growth timber.
White Pine		19,300	19,300	Mountainous, arid, grazing, little timber.
Total	18,194,466	18,138,875	36,333,341	
Elko:				
Churchill	127,430	7,000	134,430	Do.
Elko	6,347,864	673,577	7,021,441	Do.
Eureka	1,044,217	1,081,001	2,125,218	Mountainous, arid, grazing, no timber.
Humboldt	1,396,736	199,426	1,596,162	Do.
Lander	902,486	1,088,953	1,991,439	Do.
Lincoln	653,782	101,184	754,966	Mountainous, arid, grazing, little timber.
Nye	427,309	147,103	574,412	Mountainous, arid, grazing, no timber.
White Pine	2,877,270	1,709,261	4,586,531	Do.
Total	13,777,094	5,007,505	18,784,596	
State total	31,971,560	23,146,380	55,117,940	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

NEW MEXICO.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Clayton:				
Colfax	16,780		16,780	Arid, broken, grazing.
Mora	7,640		7,640	Grazing.
Quay	2,560		2,560	Do.
San Miguel	11,640		11,640	Grazing, broken.
Union	149,360		149,360	Do.
Total	187,980		187,980	
Fort Sumner:				
Chaves	218,240		218,240	Broken, grazing.
Curry	6,040		6,040	Grazing.
De Baca	236,480		236,480	Do.
Guadalupe	131,530		131,530	Do.
Lincoln	362,440		362,440	Do.
Roosevelt	18,940		18,940	Broken, grazing.
Total	973,670		973,670	
Las Cruces:				
Dona Ana	1,419,534	224,492	1,644,026	Grazing, mountainous.
Grant	425,822	575,387	1,001,209	Do.
Lincoln	158,370	23,000	181,370	Do.
Luna	821,618	137,313	958,931	Do.
Otero	1,183,289	296,143	1,479,432	Do.
Sierra	1,150,000	233,011	1,383,011	Do.
Socorro	1,842,456	1,031,226	2,873,682	Do.
Total	7,001,089	2,520,572	9,521,661	
Roswell:				
Chaves	742,940	304,200	1,047,140	Grazing, rolling prairie.
Eddy	684,960	502,060	1,187,020	Mostly prairie, timber in mountains.
Lea	250,960	70,240	321,200	Grazing, rolling prairie.
Lincoln	336,990	184,200	521,190	Grazing, timber in mountains.
Otero	100,800	641,080	741,880	Grazing.
Roosevelt	17,960		17,960	Do.
Socorro	3,280	81,960	85,240	Undulating prairie.
Torrance	24,460		24,460	Prairie, grazing.
Total	2,162,350	1,783,740	3,946,090	
Santa Fe:				
Bernalillo	51,580	19,591	71,171	Timber, grazing, agricultural.
Colfax	1,506		1,506	Mountainous, grazing, coal.
Guadalupe	65,113	2,343	67,456	Grazing, agricultural.
McKinley	305,912	114,000	419,912	Mountainous, timber, grazing, coal.
Mora	9,555		9,555	Mountainous, grazing, agricultural, coal.
Rio Arriba	596,600	14,865	611,465	Do.
Sandoval	442,893	69,120	512,013	Do.
San Juan	729,225	11,029	740,254	Grazing, agricultural, coal.
San Miguel	75,703		75,703	Timber, grazing, agricultural.
Santa Fe	18,200	20,693	38,893	Mountainous, grazing, coal.
Socorro	472,055	17,940	489,995	Do.
Taos	129,400	124,700	254,100	Mountainous, grazing, timber, agricultural.
Torrance	55,435	31,859	87,294	Timber, grazing, saline, agricultural.
Valencia	694,049	8,083	702,132	Do.
Total	3,647,226	434,223	4,081,449	
Tucumcari:				
Curry	620		620	Grazing, agricultural, some broken.
Guadalupe	4,960		4,960	Broken, grazing, some agricultural.
Quay	36,295	5,300	41,595	Grazing, agricultural, some broken.
San Miguel	2,780		2,780	Broken, grazing, some agricultural.
Union	16,178	8,740	24,918	Rolling, grazing, some agricultural.
Total	60,833	14,040	74,873	
State total	14,033,148	4,752,575	18,785,723	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

NORTH DAKOTA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Bismarck:				
Burleigh	274		274	Agricultural and grazing.
Emmons	133		133	Do.
Logan	610		610	Do.
McLean	448		448	Do.
Mercer	524		524	Do.
Sioux	2,656		2,656	Do.
Total	4,645		4,645	
Dickinson:				
Billings	9,118		9,118	Rough, grazing.
Bowman	15,946		15,946	Do.
Dunn	8,693		8,693	Do.
Golden Valley	1,468		1,468	Do.
McKenzie	12,359		12,359	Do.
Slope	1,809		1,809	Do.
Total	49,393		49,393	
Minot:				
Benson	84		84	Grazing.
Bottineau	103		103	Do.
Burke	204		204	Do.
Cavalier	119		119	Do.
McHenry	637		637	Do.
McLean	261		261	Do.
Mountrail	4,469		4,469	Do.
Pierce	364		364	Do.
Renville	238		238	Do.
Sheridan	40		40	Do.
Ward	741		741	Do.
Total	7,260		7,260	
Williston:				
Divide	1,706		1,706	Broken, grazing.
McKenzie	19,065		19,065	Broken, grazing, and farming.
Mountrail	1,764		1,764	Broken, grazing.
Williams	6,714		6,714	Broken, grazing, and farming.
Total	29,249		29,249	
State total	90,547		90,547	

OKLAHOMA.

Guthrie:				
Alfalfa	40		40	Grazing.
Beaver	310		310	Do.
Beckham	370		370	Rough, grazing.
Blaine	139		139	Grazing.
Canadian	397		397	Sandy, grazing.
Cimarron	4,520		4,520	Grazing.
Cleveland	583		583	Sandy, grazing.
Custer	559		559	Grazing.
Dewey	3,170		3,170	Do.
Ellis	2,620		2,620	Sandy, grazing.
Grant	5		5	Rough, grazing.
Greer	240		240	Do.
Harmon	336		336	Do.
Harper	301		301	Grazing.
Jackson	483		483	Sandy, grazing.
Kingfisher	29		29	Do.
Major	1,794		1,794	Rough, grazing.
Pottawatomie	121		121	Sandy, grazing.
Roger Mills	2,433		2,433	Rough, grazing.
Texas	1,205		1,205	Grazing.
Woods	1,052		1,052	Rough, grazing.
Woodward	257		257	Grazing.
State total	20,994		20,994	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

OREGON.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Burns:				
Crook	56,163		56,163	Grazing, timber, and farming.
Grant	99,916	480	100,396	Do.
Harney	3,386,094	35,791	3,421,885	Do.
Wheeler	5,840		5,840	Do.
Total	3,548,013	36,271	3,584,284	
La Grande:				
Baker	148,260	586	148,846	Timbered, mountainous, grazing, mineral, and farming.
Grant	50,180		50,180	Timbered, farming, grazing, and mineral.
Morrow	9,760		9,760	Timbered, farming, and grazing.
Umatilla	27,740	291	28,031	Timbered, farming, grazing, and arid.
Union	8,140		8,140	Timbered, farming, and grazing.
Wallowa	30,720		30,720	Mountainous, farming, and grazing.
Total	274,800	877	275,677	
Lakeview:				
Deschutes and Crook	413,055		413,055	Agricultural, mountainous, and grazing.
Klamath	1,011,548	95,232	1,106,780	Agricultural, timber, and grazing.
Lake	2,571,487	134,262	2,705,749	Agricultural, mountainous, timber, and grazing.
Total	3,996,090	229,494	4,225,584	
Portland:				
Benton	9,940		9,940	Broken, grazing, agricultural.
Clackamas	31,597		31,597	Hilly, broken, grazing, agricultural.
Clatsop	1,152		1,152	Do.
Columbia	1,254		1,254	Hilly, grazing, agricultural.
Lincoln	23,312		23,312	Do.
Linn	10,867		10,867	Do.
Marion	8,882		8,882	Do.
Multnomah	1,353		1,353	Do.
Polk	3,930		3,930	Do.
Tillamook	38,993		38,993	Do.
Washington	2,881		2,881	Do.
Yamhill	11,022		11,022	Do.
Total	145,183		145,183	
Roseburg:				
Benton	2,838		2,838	Timber, grazing.
Coos	17,761		17,761	Do.
Curry	36,687	2,100	38,787	Mountainous, timber, grazing.
Douglas	36,472	4,960	41,432	Mineral, grazing, timber.
Jackson	265,924		265,924	Timber, grazing, fruit.
Josephine	115,860	6,320	122,180	Timber, grazing, mineral, fruit.
Klamath	3,280		3,280	Timber.
Lane	30,865		30,865	Timber, grazing, mineral.
Lincoln	1,155		1,155	Broken, grazing.
Linn	316		316	Hilly, grazing.
Total	511,158	13,380	524,538	
The Dalles:				
Crook	193,388	1,260	194,648	Grazing, broken, hilly, and mountainous.
Deschutes	123,233		123,233	Do.
Gilliam	1,160	1,760	2,920	Do.
Grant	26,108		26,108	Do.
Hood River	67		67	Do.
Jefferson	18,621	5,120	23,741	Do.
Morrow	814		814	Do.
Sherman	15,199	640	15,839	Do.
Wasco	14,780		14,780	Do.
Wheeler	12,240		12,240	Do.
Total	405,610	8,780	414,390	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

OREGON—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Vale:				
Baker	98,878		98,878	Grazing, dry farming, timber.
Grant	11,489		11,489	Mountainous, timber.
Harney	417,675		417,675	Grazing, dry farming.
Malheur	4,003,373	460,030	4,463,403	Grazing, dry farming, some timber.
Total	4,531,415	460,030	4,991,445	
State total	13,412,269	748,832	14,161,101	

SOUTH DAKOTA.

Belle Fourche:				
Butte	95,400		95,400	Rolling, prairie, grazing.
Harding	24,680		24,680	Do.
Meade	6,520		6,520	Broken, grazing.
Total	126,600		126,600	
Gregory:				
Bennett	14,980		14,980	Grazing; sand hill.
Gregory	219		219	Very rough; grazing.
Mellette	2,530		2,530	Rough and rolling; grazing.
Total	17,729		17,729	
Lemmon:				
Corson	140		140	River bottom.
Harding	38,000		38,000	Rough and mountainous; stony.
Perkins	12,800		12,800	Do.
Total	50,940		50,940	
Pierre:				
Brule	440		440	Rough, hilly, grazing.
Campbell	602		602	Do.
Charles Mix	246		246	Low and wet.
Clark	80		80	Do.
Clay	284		284	Low, wet, sand bar.
Coddington	1		1	Low and wet; on lake.
Day	24		24	Low and wet; small tracts.
Edmunds	240		240	Low, wet, lake bed.
Haakon	5,720		5,720	Rough, hilly, grazing.
Hughes	228		228	Do.
Jackson	22,205		22,205	Do.
Kingsbury	1		1	Low and wet, on lake.
Potter	120		120	Rough, hilly, grazing.
Spink	360		360	Low, wet, lake bed.
Stanley	9,892		9,892	Rough, hilly, grazing.
Sully	795		795	Do.
Walworth	386		386	Do.
Total	41,624		41,624	
Rapid City:				
Custer	13,940	10,781	24,721	Mountainous, timbered, mineral, and grazing land.
Fall River	22,810		22,810	Prairie, broken, grazing land.
Lawrence	960	18,618	19,578	Mountainous, timbered, mineral, and grazing land.
Meade	15,628		15,628	Prairie, broken, grazing land.
Pennington	89,108		89,108	Part mountainous, timbered, mineral; part prairie, broken, grazing land.
Total	142,446	29,399	171,845	
Timber Lake:				
Corson	24,031		24,031	Grazing, broken, hilly.
Dewey	40,092		40,092	Do.
Ziebach	88,348		88,348	Do.
Total	152,471		152,471	
State total	531,810	29,399	561,209	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

UTAH.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Salt Lake City:				
Beaver	570,899	696,032	1,266,931	Generally arid; agricultural, mineral, grazing, and mountainous.
Box Elder	1,319,349	549,982	1,869,331	Do.
Cache	7,411	227,537	234,948	Do.
Carbon	569,559	22,578	592,137	Do.
Davis	28,362		28,362	Do.
Duchesne	107,036	74,880	181,916	Do.
Emery	740,288	593,286	1,333,574	Do.
Garfield	605,320	1,842,424	2,447,744	Do.
Grand	820,203	1,077,300	1,897,503	Do.
Iron	1,022,488	25,175	1,047,663	Do.
Juab	793,422	995,201	1,788,623	Do.
Kane	585,206	1,724,663	2,309,869	Do.
Millard	1,172,720	2,106,847	3,279,567	Do.
Morgan	7,757	12,246	20,003	Do.
Piute	107,991	78,795	186,786	Do.
Rich	247,999		247,999	Do.
Salt Lake	2,422	29,318	31,740	Do.
San Juan	1,033,166	2,790,010	3,823,176	Do.
San Pete	363,246	15,397	378,643	Do.
Sevier	416,130	39,369	455,499	Do.
Summit	60,456	7,557	68,013	Do.
Tooele	1,513,509	1,955,361	3,468,870	Do.
Utah	38,278	359,032	397,310	Do.
Wasatch	21,237	1,250	22,487	Do.
Washington	663,064	49,435	712,499	Do.
Wayne	342,991	1,078,076	1,421,067	Do.
Weber	64,515		64,515	Do.
Total	13,225,024	16,351,751	29,576,775	
Vernal:				
Duchesne	102,159		102,159	Agricultural, grazing.
Uintah	857,115	749,470	1,606,585	Arid, mountainous, mineral agricultural.
Wasatch	32,728	3,740	36,468	Do.
Total	992,002	753,210	1,745,212	
State total	14,217,026	17,104,961	31,321,987	

WASHINGTON.

Seattle:				
Clallam	820		820	Burned-over mountain.
Jefferson	160		160	Rough.
King	1,640	[1]57,320	58,960	Rocky, mountainous.
Mason	160		160	Do.
Pierce		[2]56,000	56,000	Mountainous.
San Juan	600		600	Rough, rocky.
Skagit	1,620	1,800	3,420	Do.
Snohomish		[3]32,740	32,740	Rough.
Whatcom	1,940	1,000	2,940	Do.
Total	6,940	148,860	155,800	
Spokane:				
Adams	609		609	Poor farming, desert.
Douglas	172		172	Scab land.
Ferry	188,817	2,066	190,883	Timber, mineral, grazing.
Lincoln	12,657		12,657	Arid, poor farming, grazing.
Okanogan	20,025		20,025	Grazing, farming, mineral.
Pend Oreille	40,313		40,313	Mountainous, timbered.
Spokane	577		577	Scab land, rough.
Stevens	105,350	6,877	112,227	Timbered, farming, grazing, mineral.
Whitman	495		495	Grazing, poor.
Total	369,015	8,943	377,958	

[1]Including 55,400 acres within odd-section grant to Northern Pacific Ry. Co.
[2]Within odd-section grant to Northern Pacific Ry. Co.
[3]Including 32,500 acres within odd-section grant to Northern Pacific Ry. Co.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

WASHINGTON—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Vancouver:				
Clarke	4,497		4,497	In foothills, rough, some timber.
Cowlitz	5,485		5,485	Do.
Klickitat	23,303	2,810	26,113	Rough, grazing, not much timber.
Lewis	3,228	[1] 64,766	67,994	Rough, some timber, grazing.
Pacific	54		54	Rough.
Skamania	7,047	[2] 79,420	86,467	Mountainous, some timber.
Wahkiakum	318		318	Broken, rough.
Total	43,932	146,996	190,928	
Walla Walla:				
Adams	8,593		8,593	Grazing, desert, poor farming.
Asotin	16,137		16,137	Mountainous, grazing, some farming.
Benton	33,845		33,845	Grazing, desert.
Columbia	1,702		1,702	Mountainous, grazing, some timber.
Franklin	35,896		35,896	Grazing, desert.
Garfield	1,267		1,267	Grazing, mountainous.
Klickitat	6,471		6,471	Grazing, desert.
Walla Walla	2,698		2,698	Grazing, some timber.
Whitman	1,862		1,862	Grazing, some farming.
Total	108,471		108,471	
Waterville:				
Chelan	16,444	4,500	20,944	Timber, grazing, rough.
Douglas	21,550		21,550	Grazing and rough.
Grant	38,993		38,993	Sandy and grazing.
Kittitas	500		500	Rough, grazing.
Okanogan	62,377		62,377	Mountainous, grazing.
Total	139,864	4,500	144,364	
Yakima:				
Benton	69,400		69,400	Semiarid, mountainous.
Grant	23,040		23,040	Do.
Kittitas	61,600		61,600	Semiarid, mountainous, timbered.
Yakima	46,240		46,240	Do.
Total	200,280		200,280	
State total	868,502	309,299	1,177,801	

[1] Including 62,010 acres within odd-section grant to Northern Pacific Ry. Co.
[2] Within odd-section grant to Northern Pacific Ry. Co.

WISCONSIN.

Wausau:				
Adams	177		177	Sandy soil, slightly rolling.
Ashland	166		166	Sandy soil, mixed with loam.
Bayfield	1,229		1,229	Farming, rolling, somewhat sandy.
Buffalo	280		280	Agricultural.
Burnett	253		253	Fair agricultural, mixed soil.
Chippewa	205		205	Broken.
Clark	280		280	Grazing, agricultural.
Columbia	5		5	Rolling, sandy.
Crawford	16		16	Agricultural, sandy.
Douglas	240		240	Some sandy, fair agricultural.
Dunn	79		79	Agricultural.
Eau Claire	40		40	Fair agricultural, sandy loam.
Florence	120		120	Rough, hardwood.
Forest	123		123	Do.
Iron	40		40	Do.
Jackson	545		545	Rolling, soil mixed with loam.
Juneau	43		43	Grazing, sandy.
La Crosse	82		82	Sandy soil.
Lincoln	80		80	Fair agricultural.
Marinette	593		593	Agricultural, some sandy.
Monroe	108		108	Fair agricultural, pretty level.
Oconto	120		120	Hardwood, rolling.
Oneida	641		641	Broken, some timbered.
Polk	160		160	Broken, fair agricultural.

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

WISCONSIN—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Wausau—Continued.				
Portage	11		11	Agricultural, sandy soil.
Price	522		522	Sandy loam, broken.
Rusk	55		55	Fair agricultural.
Sauk	40		40	Farming.
Sawyer	160		160	Some timbered, farming.
Taylor	80		80	Broken, fair agricultural.
Trempealeau	80		80	Farming, sandy loam.
Vilas	180		180	Rough, some hardwood.
Washburn	179		179	Agricultural, sandy clay.
Wood	2		2	Sandy.
State total	6,934		6,934	

WYOMING.

Buffalo:				
Big Horn	965,378	45,120	1,010,498	Grazing, agricultural, mountainous.
Campbell	315,072		315,072	Dry farming, grazing, and rolling.
Converse	8,670		8,670	Grazing, hilly.
Hot Springs	135,321		135,321	Grazing, mountainous.
Johnson	1,004,736		1,004,736	Agricultural, dry farming, grazing, and mountainous.
Natrona	45,177		45,177	Dry lands, rolling, grazing.
Sheridan	199,036	22,840	221,876	Agricultural, grazing, and dry farming.
Washakie	1,027,326		1,027,326	Grazing, mountainous.
Total	3,700,716	67,960	3,768,676	
Cheyenne:				
Albany	616,690	21,581	638,271	About one-half broken, mountainous, other half prairie; grazing, farming; farm land mostly along streams.
Carbon	1,688,600	10,701	1,699,301	Greater portion broken, mountainous, some timber; agricultural lands along streams.
Fremont	138,200	32,979	171,179	Mountainous, arid, timber.
Goshen	11,060		11,060	Broken, grazing, dry farming.
Laramie	23,440		23,440	Prairie, broken grazing; dry-farming lands along streams irrigable.
Platte	77,220		77,220	Prairie, broken grazing; dry-farming.
Sweetwater	607,040		607,040	Mountainous, broken grazing, alkaline plains.
Total	3,162,250	65,261	3,227,511	
Douglas:				
Converse	227,985	30,130	258,115	Grazing, mountainous, mineral.
Fremont	935,103		935,103	Do.
Natrona	2,117,521		2,117,521	Do.
Niobrara	231,028		231,028	Do.
Total	3,511,637	30,130	3,541,767	
Evanston:				
Fremont	543,894	583,337	1,127,231	Farming, grazing, mountainous.
Lincoln	1,203,749	548,202	1,751,951	Farming, grazing, timber.
Sweetwater	3,631,790	172,393	3,804,183	Dry farming, grazing, alkaline.
Uinta	578,475		578,475	Dry farming and grazing.
Total	5,957,908	1,303,932	7,261,840	
Lander:				
Big Horn	167,978		167,978	Timber, mountainous, farming, and grazing.
Fremont	1,888,195	41,577	1,929,772	Arid, mountainous, farming, grazing, some stone.
Hot Springs	685,034	40,116	725,150	Farming, mineral, grazing, and timber.
Park	854,692	8,134	862,826	Timber, stone, farming, grazing, some mineral.
Washakie	3,155		3,155	Broken, farming, grazing.
Total	3,599,054	89,827	3,688,881	

Statement showing the area of land unappropriated and unreserved on July 1, 1919—Con.

WYOMING—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Sundance:				
Campbell	378,546	106,290	484,836	Broken, grazing.
Converse	15,242	.....	15,242	Prairie, grazing.
Crook	171,867	2,921	174,788	Semimountainous lands, some timber.
Niobrara	18,184	.....	18,184	Broken, grazing lands.
Weston	206,254	.....	206,254	Small areas of timber, rolling, grazing.
Total	790,093	109,211	899,304	
State total	20,721,658	1,666,321	22,387,979	

RECAPITULATION BY STATES.

State.	Area in acres.		
	Surveyed.	Unsurveyed.	Total.
Alabama	37,740	.....	37,740
Arizona	7,142,565	13,572,220	20,714,785
Arkansas	300,599	7,000	307,599
California	15,654,405	4,585,572	20,239,977
Colorado	8,251,297	1,296,681	9,547,978
Florida	117,784	.....	117,784
Idaho	6,745,861	3,942,747	10,688,608
Kansas	4,956	.....	4,956
Louisiana	30,129	.....	30,129
Michigan	73,106	.....	73,106
Minnesota	240,314	.....	240,314
Mississippi	39,933	.....	39,933
Missouri	78	.....	78
Montana	4,182,643	2,950,951	7,133,594
Nebraska	92,826	.....	92,826
Nevada	31,971,560	23,146,380	55,117,940
New Mexico	14,033,148	4,752,575	18,785,723
North Dakota	90,547	.....	90,547
Oklahoma	20,994	.....	20,994
Oregon	13,412,269	748,832	14,161,101
South Dakota	531,810	29,399	561,209
Utah	14,217,026	17,104,961	31,321,987
Washington	868,502	309,299	1,177,801
Wisconsin	6,934	.....	6,934
Wyoming	20,721,658	1,666,321	22,387,979
Grand total	138,788,684	74,112,938	212,901,622

ALASKA.

The unappropriated lands in Alaska are not included herein. The total area of Alaska is 378,165,760 acres, of which about 25,384,000 [1] acres are reserved. Approximately 1,144,449 acres have been surveyed under the rectangular system.

[1] 20,713,205 acres thereof are reserved for forestry purposes.

REPORT OF THE COMMISSIONER OF PENSIONS

COMMISSIONERS OF PENSIONS SINCE 1833.

Name.	By whom appointed.	Whence appointed.	Date of commission.
Edwards, James L	Jackson	Virginia	Mar. 3, 1833
Heath, James E	Fillmore	do	Nov. 27, 1850
Waldo, Loren P	Pierce	Connecticut	Mar. 17, 1853
Minot, Josiah	do	New Hampshire	Aug. 1, 1855
Whiting, George C	do	Virginia	Jan. 19, 1857
Barrett, Joseph H	Lincoln	Ohio	Apr. 15, 1861
Cox, Christopher C	Johnson	Maryland	July 28, 1868
Van Aernam, Henry	Grant	New York	May 1, 1869
Baker, James H	do	Minnesota	Apr. 20, 1871
Atkinson, Henry M	do	Nebraska	Mar. 26, 1875
Gill, Charles R	do	Wisconsin	Feb. 10, 1876
Bentley, John A	do	do	Mar. 28, 1876
Dudley, William W	Garfield	Indiana	June 27, 1881
Clarke, Otis P. G	Arthur	Rhode Island	Nov. 15, 1884
Black, John C	Cleveland	Illinois	Mar. 19, 1885
Tanner, James	Harrison	New York	Mar. 27, 1889
Raum, Green B	do	Illinois	Oct. 19, 1889
Lochren, William	Cleveland	Minnesota	Apr. 13, 1893
Murphy, Dominic I	do	Pennsylvania	May 28, 1896
Evans, Henry Clay	McKinley	Tennessee	Apr. 1, 1897
Ware, Eugene F	Roosevelt	Kansas	May 10, 1902
Warner, Vespasian	do	Illinois	Mar. 4, 1905
Davenport, James L	Taft	New Hampshire	Nov. 26, 1909
Saltzgaber, Gaylord M	Wilson	Ohio	May 20, 1913

The Bureau of Pensions was organized as a bureau of the War Department under act of March 2, 1833 (4 Stat. L., 622). It became a bureau of the Interior Department when that department was established by the act of March 3, 1849 (9 Stat. L., 395).

REPORT OF THE COMMISSIONER OF PENSIONS.

WASHINGTON, D. C., *August 1, 1919.*

SIR: I have the honor to submit this annual report of the operations of the Bureau of Pensions for the fiscal year beginning July 1, 1918, and ending June 30, 1919.

GENERAL.

Statistical and financial information, usually sought for by committees and individuals of Congress and those of the public at large who feel an interest in the matters presented, is fully shown in the tables appended hereto. Each exhibit tells its story of the varied activities of the Pension Bureau.

To save others the necessity of making a painstaking search of the tables to procure knowledge of the matters most frequently inquired about, I have caused to be prepared and append herewith a statement of certain items concerning fiscal operations and important facts, as follows:

FISCAL OPERATIONS.

There were paid out the following amounts:

For pensions during the fiscal year:	
1918	$179,835,329
1919	222,159,292
For fees and expenses of examining surgeons:	
1918	23,756
1919	11,228
For field and special examinations:	
1918	79,729
1919	90,000
To pensioners in foreign countries:	
1918	983,687
1919	1,188,188

For the last seven years the total cost for maintenance and expense of the pension system was as follows:

1913	$2,543,246
1914	2,066,507
1915	1,779,860
1916	1,656,722
1917	1,562,855
1918	1,527,615
1919	1,433,192

INTERESTING FACTS AND FIGURES.

The following information regarding matters connected with the payment of pensions is of general interest:

Total pensioners on the roll June 30:		
1918		646,895
1919		624,427
Invalids	313,140	
Widows	303,311	
Dependents	4,689	
Minors	2,241	
Helpless children	917	
Nurses	129	
Civil War soldiers on the roll June 30:		
1918		208,808
1919		271,391
Civil War widows on the roll June 30:		
1918		288,815
1919		293,244
Number of deaths:		
Civil War soldiers—		
1918		30,466
1919		27,703
Widows, minor children, and dependents—		
1918		18,412
1919		19,217
The largest number of Civil War soldiers on the roll was in 1898		745,822
The largest number of Civil War widows on the roll was in 1912		304,373
War of 1812, widows surviving June 30, 1919		81
War with Mexico, June 30, 1919:		
Survivors		215
Widows		2,739
War with Spain:		
Total number of original claims allowed by Pension Bureau		41,335
Number on rolls June 30, 1919		28,251
Changes of post-office addresses of pensioners:		
1918		128,937
1919		120,907
Employees at the beginning of the fiscal year:		
1918		1,091
1919		962
Volumes in military library:		
1918		1,745
1919		2,175
Total pieces of mail handled in 1919:		
Incoming		716,321
Outgoing		3,369,933
Inclosures		799,883
Cases acted on under act of Mar. 3, 1899 (division of pension between husband and wife), 1919		429
Cases acted on under act of Aug. 8, 1882 (to wife where husband is insane or imprisoned), 1919		26

Cases under guardianship, 1919	7,263
Amount of fees paid to attorneys, 1919	116,942
Income, refundments, etc.:	
For addresses, certified copies, etc. (act Aug. 24, 1912)	$2,153.70
Refundments to pension appropriations	6,890.65
Miscellaneous	3,041.15
Total	12,084.90
Reimbursements:	
Amount allowed, expenses of last sickness and burial, for 1918	$237,113.35
Amount allowed, expenses of last sickness and burial, for 1919	$280,830.25
Total number entered on medal-of-honor roll (act Apr. 27, 1916)	357

NEW PENSION LEGISLATION.

Act of July 16, 1918.

On July 16, 1918, there was approved an act to pension widows and minor children of officers and enlisted men who served in the War with Spain, Philippine insurrection, or in China:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the passage of this act if any volunteer officer or enlisted man who served ninety days or more in the Army, Navy, or Marine Corps of the United States, during the War with Spain or the Philippine insurrection, between April twenty-first, eighteen hundred and ninety-eight, and July fourth nineteen hundred and two, inclusive, service to be computed from date of enlistment to date of discharge, or any officer or enlisted man of the Regular Establishment who rendered ninety days or more actual military or naval service in the United States Army, Navy, or Marine Corps in the War with Spain or the Philippine insurrection between April twenty-first, eighteen hundred and ninety-eight, and July fourth nineteen hundred and two, inclusive, or as a participant in the Chinese Boxer rebellion campaign between June sixteenth, nineteen hundred, and October first, nineteen hundred, and who has been honorably discharged therefrom, has died or shall hereafter die leaving a widow without means of support other than her daily labor, and an actual net income not exceeding $250 per year, or leaving a minor child or children under the age of sixteen years, such widow shall upon due proof of her husband's death, without proving his death to be the result of his Army or Navy service, be placed on the pension roll from the date of the filing of her application therefor under this act, at the rate of $12 per month during her widowhood, and shall also be paid $2 per month for each child of such officer or enlisted man under sixteen years of age, and in case of the death or remarriage of the widow, leaving a child or children of such officer or enlisted man under the age of sixteen years, such pension shall be paid such child or children until the age of sixteen: *Provided*, That in case a minor child is insane, idiotic, or otherwise permanently helpless, the pension shall continue during the life of said child, or during the period of such disability, and shall commence from the date of application therefor after the passage of this act: *Provided further*, That said widow shall have married said officer or enlisted man previous to the passage of this act: *Provided, however*, That this act shall not be so construed as to reduce any pension under any act, public or private.

Under this act pensions have already been granted to 992 widows, 72 minors, and 1 helpless child. There are a large number of applications pending in other cases.

Attention is called to the fact that a distinction was made between service of volunteer officers and enlisted men and those in the Regular Establishment as a prerequisite to the allowance of widows and minors pensions in said act provided for. In the case of Anna, as widow of Oscar J. de Rochmont, decided by the Assistant Secretary of the Interior, January 31, 1919, it was held:

Volunteer officers and enlisted men mentioned in the act of July 16, 1918, refer to those who were members of volunteer organizations as distinguished from the Regular Establishment.

Their dependents are pensionable if such an officer or enlisted man served during the period of any of the wars mentioned in said act for 90 days or more and were honorably discharged, independent of the geographical locality of such service.

The dependents of an officer or enlisted man of the Regular Establishment are not pensionable under said act unless such officer or enlisted man rendered actual service. "Actual military service" mentioned in said act are words of limitation, and are descriptive of such duty in a war as is to be performed by one in the Army or Navy from being on the scene of conflict; that is to say, at the theater of operations on sea or land; of invasion of enemy territory; of repelling invasion by the enemy, and the like

When the bill was pending before the House of Representatives, Mr. Keating, of Colorado, in charge of the bill, made a preliminary statement, page 9672 of the Congressional Record of July 9, 1918:

This bill does not provide pension for the widow or the minor children of a soldier or sailor of the Regular Establishment unless he actually left the confines of the United States and participated actively in the War with Spain.

In the case of Rebecca, as widow of Jeremiah Cottrell, decided by the Assistant Secretary of the Interior, May 19, 1919, it was held:

Enlistments in the Navy under the naval appropriation act approved May 4, 1898, for the naval service for the fiscal year ending June 30, 1899, were enlistments in the Regular Naval Establishment, and such persons were not "volunteer officers or enlisted men" as are mentioned in the act of July 16, 1918.

The claimant's husband was enlisted under the provisions of the act of May 4, 1898, was a member of the Regular Naval Establishment, and as his entire service was outside the zones of conflict in the War with Spain, Philippine insurrection, or Chinese Boxer rebellion campaign, his widow has no title to pension under the act of July 16, 1918.

Special Acts of Congress.

During the year 28 omnibus bills to grant pensions by special acts of Congress were enacted into law. These acts granted pension or increase of pension to 3,442 individuals among whom was the widow of ex-President Roosevelt.

PATRIOTISM.

Bureau of Pensions employees in the military and naval service during the World War:	
Army	24
Navy	5
Marine Corps	1
Total	30
War work contributions of the Pension Bureau during the World War:	
American Red Cross	$5,570.81
Interior Department war relief fund	2,372.80
Interior Department bed for American soldiers in Neuilly Hospital, France	200.60
Salvation Army	815.05
National War Work Council, American Y. M. C. A.	685.60
Knights of Columbus	131.00
United war work campaign	3,401.81
Near East fund	234.82
Serbian movable hospital	60.78
Total	13,473.27
Subscriptions to Liberty loans:	
First (810 of 900 employees subscribed)	$153,000.00
Second (836 of 1,041 employees subscribed)	144,350.00
Third (843 of 982 employees subscribed)	146,650.00
Fourth (845 of 868 employees subscribed)	175,000.00
Fifth (794 of 794 employees subscribed)	250,050.00
Total	869,050.00
War savings stamps: Total purchased to June 30, 1919	$43,513.32

AGE OF EMPLOYEES.

The following statement shows the number, ages, etc., of employees in the Pension Bureau on the 1st day of July, 1919, considered especially with reference to civil-service retirement:

Number in classified civil service	874
Age of oldest employee	88
Number over 80 years of age	26
Number between 65 and 80 years of age	266
Based on age of 65, number eligible for retirement	292
Percentage of all employees eligible for retirement	33.4
Average age of all employees July 1, 1919	58

METAL BOXES FOR FILES.

In former reports praise was given on account of the superiority of metal boxes for the files over the leather straps theretofore used. Although the boxes cost less than the straps, they are very superior, as constant use is proving. Five thousand three hundred and fifty

more boxes were purchased during the fiscal year ended June 30, 1919. The cost per box is 64 cents; the cost per strap, 80 cents. The boxes do not wear out and the straps do. A total of 23,500 boxes have been purchased. It is estimated that 56,462 more boxes would be sufficient in which to place all the files. Each box will hold approximately 30 cases.

MARRIAGE AND DIVORCE.

The Bureau of Pensions is not a mere administrative office. It is a court called upon to construe the law and to exercise judicial functions, determining the rights of parties and the Government under the law and facts. There are very many cases in which the marital status of parties must be determined. There were 589 such cases reached for action during the fiscal year in which the issues were so complicated as to require formal opinions by the law division for their determination.

Section 2 of the act of August 7, 1882 (22 Stat. L., 345) provides that marriages shall be proven in pension cases to be legal marriages according to the law of the place where the parties resided at the time of marriage or at the time when the right to pension accrued.

Hardly any two of the 48 States of the Union have the same laws concerning marriage and divorce as determined by the statutes of the several States and the decisions of the highest tribunals thereof. There are presumptions of the validity of the marriages indulged in in some of the States which are not permitted in others. Decrees of divorce in one may deny the right of one or the other party to the marriage contract to remarry; in other States a divorce in every case discharges the parties from the obligation of the marriage contract and frees them absolutely.

Complaint has been made with increasing volume because of the rigorous requirement of the law, and, therefore, the practice in the Pension Bureau, as to the proof of validity of the marriage relation. Many cases occur in which claimants for pension are required to go back 20, 30, 40, and even 50 years to prove the death or divorce of former spouses, so as to make clear the legality of their own relation. This in numerous cases imposes upon the widow applicants a peculiar hardship.

After meeting the soldier, going through a ceremonial marriage with him, and living with him in the ostensible relation of husband and wife for a long period of time, she is called upon after his death to prove whether her husband had ever been married before, and, if so, what had become of the former wife or wives.

I think there should be an amelioration of the rule, but the matter is wholly for Congress. It might, for instance, declare that cohabitation for a fixed period of time up to the date of the soldier's death

should give rise to a conclusive presumption for pensionable purposes that the wife thus cohabiting was the legal widow of the soldier to the exclusion of any other. Often husbands who are parties to a ceremonial marriage are not communicative as to their previous history. Wives feel that they have no concern about the matter until after the soldier husband's death the widow learns to her dismay that children born as she supposed in lawful wedlock have the stigma of bastardy, and she is denied a pension because she is unable to prove that the soldier was legally divorced from a former spouse, information of whom came after the soldier's death.

The Pension Bureau has no power under the law to change its long-continued practice, but the hardship imposed upon worthy women is made more manifest by the lapse of time.

LANDS FOR THE LOYAL.

The Secretary of the Interior has a fine purpose of aiding our soldiers and sailors of the great world war to procure land for homes for themselves and their families.

For service in wars prior to 1855, the Pension Bureau issued land warrants as follows:

	Number.	Acres.
War of the Revolution	16,663	2,666,080
War of 1812	29,471	4,891,520
Act of 1847	88,274	13,213,040
Act of 1850	189,146	13,168,560
Act of 1852	11,992	694,400
Act of 1855	263,155	34,159,670
Total	598,701	68,793,870

MONTHLY PAYMENT OF PENSIONS.

In the report of the Commissioner of Pensions for the year 1914 this subject was spoken of. It was there said that the commissioner found a great division of sentiment among the soldiers. Nothing was then said about the sentiment among the widow pensioners, who now have become the most numerous class. It was in said report stated that the commissioner had informed the pensioners that the Secretary of the Interior was in sympathy with the old soldiers, and would be in favor of the payment of pensions monthly if that would be helpful to them and that the commissioner took the same stand. For the additional labor and expense necessary in the Pension Bureau an estimate has recently been furnished the Committee on Invalid Pensions in the House of Representatives, showing that for the current year an additional appropriation of $175,000 would cover the cost. There seems to be a general demand now among the soldiers themselves and their widows for the monthly payment.

The argument in favor of more frequent payment is patent to everybody and need not be here set forth. Congress itself has provided that insurance, allotments, and compensation, all of which are paid through the Bureau of War Risk Insurance, shall be paid monthly.

A bill is now pending to provide a civil-service retirement law, which, if adopted, would require payment monthly. So it seems the policy of the Government, as well as employers generally, to make payments at shorter periods than quarterly.

The system of paying pensions through a disbursing office in the bureau was established to take the place of the pension agency system, on February 1, 1913. In the period of six years and five months from that date to June 30, 1919, there was paid out in pensions a total of $1,140,433,323.10, and the accounts covering that total, prepared, certified, paid, and administratively examined in the bureau, have been accepted by the auditing officers of the Treasury with no item of disallowance on account of improper payment. At the beginning of said period the bureau force employed in paying pensions numbered 275. At its close the total number so employed was 163, a decrease of 40 per cent. In the same period there was a decrease of 25 per cent in the number of pensioners on the roll, the number on February 1, 1913, being about 837,000, and on June 30, 1919, 624,427.

Should Congress provide for civil-service retirement, the monthly payment of pensions, and the transfer of the compensation feature of the Bureau of War Risk Insurance to the Bureau of Pensions, this bureau could easily assimilate and dispose of the additional work entailed, at a minimum outlay for clerk hire and other necessary expenses.

PENSION BUREAU WORK.

Lincoln in his second inaugural address said: "To bind up the Nation's wounds, to care for him who shall have borne the battle and for his widow and his orphan," and this very aptly expresses the purpose for which the Pension Bureau was created. The bureau has by years of study, training, and experience built up an efficient system for handling pension claims.

Many people who are not posted have an erroneous impression of the workings of the Pension Bureau. They regard it as a simple thing to take up a pension claim and immediately dispose of it. There have been and are many laws on the subject of pensions. No pension can be allowed unless there is a law to justify it. The numerous pension laws have required consideration and interpreta-

tion and there are now published 20 octavo printed volumes in which are the opinions of the Secretary of the Interior determining questions that have arisen in pension cases.

A claim must be filed in the Pension Bureau setting forth under what law the claim is made and the facts constituting the right of the claimant to pension.

All claims are first received in the Mail Section, where they are stamped with the date of receipt and from thence forwarded to the Law Division where the validity of the declaration is determined. From the Law Division they go to the Record Division where the claim is properly recorded, jacketed, and given a number. The record is made in various ways for purposes of statistics and information and so that the claim may be readily found. In the Record Division have been prepared and are on file about 6,000,000 numerical and alphabetical record cards. From there the claim goes to one of the adjudicating divisions which are the Civil War and the Army and Navy, which are made up of persons who by training, study, and experience have qualified themselves for properly making calls for evidence to establish title to pension and for assembling, examining, and weighing the evidence when submitted. After the case is determined in the adjudicating division it goes to the Board of Review, which has a skilled corps of reviewers and re-reviewers, who by special fitness, close application, long experience and a knowledge of the pension laws and decisions, have become expert in determining the rights of claimants for pension. No claim is rejected unless it has been considered and disallowed by an examiner, reviewer, and reviewer, and every claim which is allowed, must have the concurrence of three persons of the same class.

Should an inquiry be necessary in the field, it is referred to the Special Examination Division, which has an efficient organization and superior facilities and equipment for such field examinations as are necessary to determine the merits of doubtful or difficult claims, or those in which criminal features are involved. Should a medical question present itself for solution, it is sent to the Medical Division which has a highly competent, technical, and experienced corps of medical examiners, reviewers, and referees to pass on and determine the same. There are over 1,400 physicians and 500 specialists throughout the United States who assist the Medical Division through personal examinations of invalid soldier applicants for pension. Should questions of law arise they are sent to the Law Division, which has a corps of trained legal men and assistants to pass on questions relating to marriage, divorce, attorneyship, guardianship, and interpretation of laws, and to handle cases involving criminal features and recovery by civil action. Should a claim be allowed, it is sent to the Certificate Division, which has charge of issuing, num-

bering, and recording certificates granting pensions, keeping the grand roll on which is entered the name of every person ever receiving a pension certificate, granting all permits to draw pension, and the issuing of duplicate certificates in lieu of those lost or destroyed. The total number of certificates issued by the office in 1919 was 76,503; 6,227,000 is the approximate number issued on account of all claims allowed since the beginning. The certificates then go to the Finance Division where the roll for payment of pensions is made up, and the pensions according to that roll are paid by the Disbursing Division. These divisions are supplied with the necessary equipment and machinery for preparing and mailing promptly millions of checks each year, all being made out, addressed, signed, and sealed by electrical machinery operated by skilled employees. The filing system of the Pension Bureau seems to be as near perfect as human ingenuity can make it, and any one of the immense number of claims is readily accessible at all times. Admitted and abandoned claims are filed on the top floor of the Pension Building. The pending claims are filed in the adjudicating divisions, and 2,663,381 cases are on file weighing more than 1,176,000 pounds. Each package contains all of the files in the claim of the soldier, and the claim of his widow and minor children, if any. The millions of cases in the files of the bureau containing much of historical value relating to all of the wars in which the United States has participated, have been the means of settling many controversies of titles to land and cognate matters, and have been of great service in determining the rights of individuals to become members of various patriotic societies and have been invaluable in genealogical research.

The average number of employees in the Pension Bureau to do this work during the last year was 883. The various divisions have numerous duties to perform beside those above enumerated. The entire system, though complex, is carefully adjusted in its various parts and moves regularly and smoothly toward the accomplishment of its purpose of determining the rights of claimants to pension.

Operations of Special Examination Division for four years.

	1916	1917	1918	1919
Appropriation	$85,000.00	$80,000.00	$80,000.00	$90,000.00
Expended	84,721.50	79,503.44	79,728.66	90,000.00
Unexpended balance	278.50	496.56	271.34	.....
Average number of examiners	49	51	49	46
Depositions taken	26,457	26,595	29,506	34,314
Deposition per examiner	538	543	605	738
Reports submitted	5,417	5,590	5,813	6,134
Reports per examiner	110	115	119	132
Cases disposed of	2,608	2,829	3,174	3,802
Cost per case	$32.49	$28.10	$25.12	$23.67

The record for 1919, viewed from any angle, is remarkable—a record breaker which sheds additional luster upon the field corps and pays high tribute to the special examination service generally.

EMPLOYEES AND PROMOTIONS.

The restriction which heretofore prevented the Pension Bureau from making promotions, allowing only one where there were four vacancies, was removed by Congress for the fiscal year of 1920, and this will open the door of hope and preferment to our faithful and deserving employees. Only a few vacancies exist, and these will be filled after the most careful consideration. Some who are deserving will not be promoted, because the places to be filled are fewer in number than are the employees whose merits thus deserve recognition.

Very respectfully,

G. M. SALTZGABER,
Commissioner.

The SECRETARY OF THE INTERIOR.

EXHIBIT 1.—*Pensioners on the roll June 30, 1919, and June 30, 1918.*

	1919	1918	Gain.	Loss.
Regular Establishment:				
Invalids	14,655	15,233		578
Widows	2,922	2,953		31
Minor children	251	255		4
Mothers	1,217	1,228		11
Fathers	161	162		1
Brothers, sisters, sons, and daughters	8	7	1	
Helpless children	4	5		1
Civil War:				
Act Feb. 6, 1907—				
Survivors	579	1,024		445
Act May 11, 1912—				
Survivors	260,127	266,443		6,316
General law—				
Invalids	10,418	30,920		20,502
Widows	42,773	45,323		2,550
Minor children	86	100		14
Mothers	189	248		59
Fathers	17	18		1
Brothers, sisters, sons, and daughters	683	636	47	
Helpless children	399	417		18
Act June 27, 1890—				
Invalids	267	421		154
Minor children	1,698	2,083		385
Helpless children	507	505	2	
Act Apr. 19, 1908—				
Widows without children	247,940	240,661	7,279	
Widows with children	2,531	2,831		300
Act Aug. 5, 1892—				
Nurses	129	163		34
War with Spain:				
Invalids	23,382	23,538		156
Widows	1,262	1,264		2
Minor children	131	147		16
Mothers	2,100	2,231		131
Fathers	303	326		23
Brothers, sisters, sons, and daughters	2	2		
Helpless children	6	5	1	
Act July 16, 1918—				
Widows	992		992	
Minors	72		72	
Helpless children	1		1	
War of 1812:				
Widows	81	99		18

EXHIBIT 1.—*Pensioners on the roll June, 30, 1919, and June 30, 1918*—Continued.

	1919	1918	Gain.	Loss.
War with Mexico:				
Survivors	215	289	.....	74
Widows	2,739	3,063	.....	324
Brothers, sisters, sons, and daughters	2	1	1	.....
Indian wars:				
Survivors	3,436	2,421	1,015	.....
Widows	2,027	1,817	210	.....
War of 1917:				
Invalids	61	24	37	.....
Widows	44	24	20	.....
Minor children	3	1	2	.....
Mothers	6	7	.....	1
Fathers	1	.....	1	.....
Total	624,427	646,895	9,681	32,149
Net loss to the roll	.....	.....	.....	22,468

DEATHS BY MONTHS.

Statement showing loss to pension roll by death, July 1, 1918, to June 30, 1919.

Months.	Invalids.		Widows, etc.		Total.
	Civil War.	Other classes.	Civil War.	Other classes.	
1918.					
July	2,143	66	1,365	47	3,621
August	2,439	62	1,518	110	4,129
September	1,823	67	1,366	57	3,313
October	2,236	87	1,349	40	3,712
November	2,037	182	1,528	89	3,836
December	1,419	104	1,346	61	2,930
1919.					
January	2,929	121	1,682	42	4,774
February	2,895	141	1,985	108	5,129
March	2,520	156	1,855	79	4,610
April	2,513	101	1,625	46	4,285
May	2,415	134	1,903	118	4,570
June	2,334	142	1,695	75	4,246
Total	27,703	1,363	19,217	872	49,155

EXHIBIT 2.—*Pensioners added to and dropped from the roll, the number on the roll at the beginning and at the close of the year, and the amount disbursed to each class of pensioners during the year ended June 30, 1919.*

Classes.	Number of pensioners beginning of year.	Gains to the roll.			Gains to classes by transfer from other classes.				Losses to the roll by—					Losses to classes.	Number of pensioners end of year.	Disbursements.
		Original.	Restoration.	Renewal.	Original.	Restoration.	Renewal.	Reissue.	Death.	Remarriage.	Limitation.	Failure to claim.	Other causes.			
Regular Establishment:																
Army invalids	11,030	338	7	19			2	2	438			11	146	157	10,646	$1,871,526.29
Army widows, etc.	2,979	151		1				1	100	37	15	3	4	7	2,966	694,480.35
Navy invalids	4,203	108	6	21					186			5	126	12	4,009	748,206.11
Navy widows, etc.	1,631	54	1						59	12	8	3	3	4	1,597	387,570.08
Civil War:																
Act Feb. 6, 1907—																
Army	983	2							114			4		317	550	139,463.93
Navy	41	1							6			1		6	29	6,049.63
Act May 11, 1912—																
Army	258,205	183	3	18	1	11	1,587	17,229	24,203			72	15	435	252,512	107,978,430.78
Navy	8,238	19		1			31	207	871			5	1	4	7,615	3,257,396.38
General law—																
Army invalids	30,511	14	3	9		2	7	422	2,421			7	1	18,289	10,250	7,907,284.11
Army widows, etc.	46,056	398		812	10		12	21	3,705	35	27	12	11	29	43,490	13,442,595.62
Navy invalids	409	1						10	43					209	168	105,496.02
Navy widows, etc.	686	17		6				3	53	1	1				657	201,301.18
Act June 27, 1890—																
Army invalids	391	3	1						43			1	3	100	248	44,478.68
Army minors, etc.	2,498	221		11					16		311		5	266	2,132	429,996.65
Navy invalids	30								2					9	19	3,094.60
Navy minors, etc.	90	4	1					1	3		14		1	5	73	12,913.80
Act Apr. 19, 1908—																
Army widows	234,412	21,158	3	957	321		15	7	14,753	375		29	34	31	241,651	75,904,645.37
Navy widows	9,080	430		8	5				687	14				2	8,820	2,757,417.61
Act Aug. 5, 1892—																
Army nurses	163								25					9	129	22,226.40
War with Spain:																
Army invalids	22,831	369	2	12					377			12	127	5	22,693	2,911,820.34
Army widows, etc.	3,758	114		6				1	177	28	24	6	4	45	3,595	744,441.52
Navy invalids	707	8							20			1	5		689	96,965.07
Navy widows, etc.	217	6							9	3	1	1			209	50,316.09
Act July 16, 1918:																
Army widows, etc.		1,050						5	2	8	1			1	1,043	73,003.24
Navy widows, etc.		22													22	1,642.87
War of 1812:																
Widows	99								18						81	17,704.33

EXHIBIT 2.—*Pensioners added to and dropped from the roll, the number on the roll at the beginning and at the close of the year, and the amount disbursed to each class of pensioners during the year ended June 30, 1919*—Continued.

Classes.	Number of pensioners beginning of year.	Gains to the roll.			Gains to classes by transfer from other classes.				Losses to the roll by—					Losses to classes.	Number of pensioners end of year.	Disbursements.
		Original.	Restoration.	Renewal.	Original.	Restoration.	Renewal.	Reissue.	Death.	Remarriage.	Limitation.	Failure to claim.	Other causes.			
War with Mexico:																
Survivors	289	1							72					3	215	$88,499.00
Widows, etc	3,064	25		2					345	1		2	1	1	2,741	669,657.10
Indian wars:																
Survivors	2,421	1,226			92				240			1	5	57	3,436	1,191,146.37
Widows	1,817	377							162	3				2	2,027	370,391.12
War of 1917:																
Army invalids	11	23							4				1		29	9,092.06
Army widows, etc	19	20								1			4		34	8,748.45
Navy invalids	13	22							1				2		32	6,616.09
Navy widows, etc	13	9								1			1		20	5,575.37
Total	646,895	26,374	27	1,883	429	13	1,654	17,909	49,155	519	402	176	500	20,005	624,427	222,159,292.70

Amount disbursed on account of Regular Establishment	$3,701,782.83
Amount disbursed on account of Civil War	212,211,890.76
Amount disbursed on account of War with Spain	3,878,189.13
Amount disbursed on account of War of 1812	17,704.33
Amount disbursed on account of War with Mexico	758,156.19
Amount disbursed on account of Indian wars	1,561,537.49
Amount disbursed on account of War of 1917	30,031.97

EXHIBIT 2A.—*Number of pensioners on the roll, by classes, at the close of the fiscal year ended June 30, 1919, and the disbursements made during the year.*

Classes.	Number.	Disbursements.	Classes.	Number.	Disbursements.
Regular Establishment:			War with Spain:		
Invalids	14,655	$2,619,732.40	Invalids	23,382	$3,008,785.41
Widows	2,922	819,845.85	Widows	1,262	410,717.46
Minor children	251	53,436.84	Minor children	131	25,692.44
Dependent relatives	1,386	208,053.74	Dependent relatives	2,405	357,339.71
Helpless children	4	714.00	Helpless children	6	1,008.00
Civil War:			Act July 16, 1918:		
Act Feb. 6, 1907—			Widows	992	71,023.58
Survivors	579	145,513.56	Minor children	72	3,622.53
Act May 11, 1912—			Helpless children	1	(1)
Survivors	260,127	111,235,827.16	War of 1812:		
General law—			Widows	81	17,704.33
Invalids	10,418	8,012,780.13	War with Mexico:		
Widows	42,773	13,424,511.69	Survivors	215	88,499.09
Minor children	86	20,774.18	Widows	2,739	669,369.10
Dependent relatives	889	131,599.46	Dependent relatives	2	288.00
Helpless children	399	67,011.47	Indian wars:		
Act June 27, 1890—			Survivors	3,436	1,191,146.37
Invalids	267	47,573.28	Widows	2,027	370,391.12
Minor children	1,698	359,396.64	War of 1917:		
Helpless children	507	82,613.81	Invalids	61	15,708.15
Act Apr. 19, 1908—			Widows	44	12,870.62
Widows	250,471	78,662,062.98	Minor children	3	367.20
Army nurses	129	22,226.40	Dependent relatives	7	1,086.00
			Total	624,427	222,159,292.70

[1] No payment made.

EXHIBIT 3.—*Statement showing the number of pensioners in each class under the general pension laws and special acts of Congress, together with the annual value of each on the rolls at the close of the fiscal year ended June 30, 1919.*

Classes.	General laws.		Special acts.	
	Number.	Amount.	Number.	Amount.
Regular establishment:				
Invalids	14,128	$2,388,174.32	527	$120,096.00
Widows, etc	4,104	725,148.00	459	168,988.00
Act Feb. 6, 1907, survivors	579	100,807.74	.....	.....
Act May 11, 1912, survivors	260,127	112,964,401.16	.....	.....
General law, Civil War:				
Invalids	6,228	2,817,655.00	4,190	1,807,476.00
Widows, etc	39,552	11,755,860.00	4,595	1,315,380.00
Act June 27, 1890:				
Invalids	267	33,984.00	.....	.....
Minors, etc	2,205	381,624.00	.....	.....
Act Apr. 19, 1908, widows	250,471	75,219,300.00	.....	.....
Act Aug. 5, 1892, nurses	91	13,104.00	38	6,732.00
War with Spain:				
Invalids	21,891	2,719,033.80	1,491	286,554.00
Widows, etc	3,488	687,584.00	316	94,232.00
Act July 16, 1918, widows, etc	1,065	178,128.00	.....	.....
War of 1812, widows	73	14,832.00	8	2,220.00
War with Mexico:				
Survivors	207	76,008.00	8	3,120.00
Widows, etc	2,577	593,076.00	164	38,892.00
Indian wars:				
Survivors	3,398	817,032.00	38	8,544.00
Widows	1,964	290,592.00	63	13,492.00
War of 1917:				
Invalids	60	14,040.00	1	360.00
Widows, etc	54	12,456.00	.....	.....
Total	612,529	211,802,840.02	11,898	3,866,086.00

Total number of pensioners	624,427
Total annual value	$215,668,926.02
Average annual value of each pension:	
All classes	345.39
Regular Establishment	177.04
Act Feb. 6, 1907	174.11
Act May 11, 1912	434.27
General law, Civil War	324.32
Act June 27, 1890	168.13
Act Apr. 19, 1908	300.31
War with Spain	139.31
Survivors, Civil War	433.78

EXHIBIT 4.—*Pensioners and amounts paid, arranged by States, Territories, insular possessions, and foreign countries, during the fiscal year ended June 30, 1919.*

	Number.	Amount.
STATES AND TERRITORIES.		
Alabama	2,156	$767,579.12
Alaska	49	17,444.97
Arizona	689	245,297.78
Arkansas	6,321	2,250,402.42
California	21,997	7,831,371.93
Colorado	6,328	2,252,894.56
Connecticut	7,518	2,676,558.36
Delaware	1,505	535,810.15
District of Columbia	6,822	2,428,768.49
Florida	3,853	1,371,745.06
Georgia	2,192	780,395.81
Idaho	1,469	522,993.39
Illinois	43,976	15,956,335.52
Indiana	37,647	13,703,084.94
Iowa	21,172	6,537,655.47
Kansas	24,918	8,971,306.36
Kentucky	16,391	5,835,523.85
Louisiana	3,588	1,277,399.76
Maine	10,857	3,865,309.14
Maryland	9,032	3,215,572.64
Massachusetts	25,038	9,277,976.52
Michigan	25,216	9,333,420.31
Minnesota	9,986	3,555,215.72
Mississippi	2,562	912,123.23
Missouri	30,660	10,915,573.20
Montana	1,713	609,862.26
Nebraska	10,982	3,909,811.64
Nevada	285	101,465.70
New Hampshire	5,030	1,790,780.69
New Jersey	15,780	5,707,995.60
New Mexico	1,443	513,736.89
New York	53,736	19,631,090.72
North Carolina	2,825	1,005,756.57
North Dakota	1,995	710,256.90
Ohio	60,902	21,582,330.04
Oklahoma	8,396	2,989,143.13
Oregon	6,029	2,146,444.58
Pennsylvania	59,072	20,630,813.44
Rhode Island	3,333	1,186,614.67
South Carolina	1,275	453,925.50
South Dakota	3,986	1,419,095.79
Tennessee	13,042	4,613,212.84
Texas	5,905	2,102,298.10
Utah	781	278,051.67
Vermont	4,927	1,754,110.53
Virginia	4,220	1,502,404.40
Washington	7,360	2,620,307.29
West Virginia	7,990	2,844,599.80
Wisconsin	15,026	5,549,556.55
Wyoming	579	206,135.53
Total	620,554	220,927,559.53
INSULAR POSSESSIONS.		
Guam	2	528.00
Hawaii	57	19,279.46
Philippines	44	15,654.32
Porto Rico	23	8,082.94
Total	126	43,544.72

	Number.	Amount.
FOREIGN COUNTRIES.		
Algeria	1	$300.00
Argentina	8	2,846.24
Australia	72	25,616.61
Austria-Hungary	26	
Azores	4	1,296.22
Bahamas	4	1,354.13
Barbadoes	1	144.00
Belgium	4	4,213.67
Bolivia	1	478.00
Brazil	5	1,357.00
British West Indies	13	4,625.14
Bulgaria	2	
Canada	2,008	714,405.24
Cape de Verde Islands	1	343.75
Ceylon	2	600.00
Chile	9	4,046.27
China	8	2,564.42
Colombia	5	1,056.00
Comoro Islands	1	301.16
Central America	9	3,202.02
Cuba	25	8,894.50
Denmark	34	12,096.49
Dutch West Indies	3	530.40
East Africa	1	300.00
Egypt	1	300.00
England	326	115,984.28
France	45	16,110.10
Germany	357	
Greece	7	2,490.45
Haiti	3	1,085.13
Hongkong	4	778.00
India	5	1,731.10
Ireland	338	120,253.64
Italy	52	18,500.56
Japan	27	9,606.06
Liberia	5	1,622.91
Malta	1	144.00
Mauritius	1	144.00
Mexico	32	11,384.96
Netherlands	5	1,526.43
Newfoundland	5	1,402.26
New Zealand	11	4,013.58
Norway	48	16,577.44
Panama	4	1,231.40
Peru	8	2,332.27
Poland	1	
Portugal	2	576.00
Roumania	1	
Russia	10	
Samoa	1	96.00
Scotland	55	18,567.90
Servia	1	
Seychelles Island	1	216.00
South Africa	5	1,565.62
Spain	4	1,353.33
St. Helena	1	542.20
Sweden	54	18,212.12
Switzerland	45	16,065.18
Tasmania	2	838.00
Tonga Islands	1	214.20
Turkey in Asia	3	898.00
Venezuela	1	476.80
Wales	27	10,745.27
Total	3,747	1,188,188.45

SUMMARY.

	Number.	Payments.
Pensioners residing in States and Territories and payments to them	620,554	$220,927,559.53
Pensioners residing in insular possessions and payments to them	126	43,544.72
Pensioners residing in foreign countries and payments to them	3,747	1,188,188.45
Total	624,427	222,159,292.70

EXHIBIT 5.—*Pensioners of the different wars on the roll at the close of each of the last five fiscal years.*

	1919	1918	1917	1916	1915
Civil War	568,343	591,793	618,326	654,007	691,606
War with Spain	28,251	27,513	28,275	28,472	28,912
War of 1812	81	99	109	115	134
War with Mexico	2,956	3,353	3,806	4,298	4,933
Indian wars	5,463	4,233	2,307	2,578	2,832
Regular Establishment	19,218	19,843	20,288	20,102	19,730
War of 1917	115	56	.....	.....	.....
Total	624,427	646,895	673,111	709,572	748,147

EXHIBIT 6.—*Comparative table of disbursements of pensions on account of the different wars for the last five fiscal years (cents omitted).*

	1919	1918	1917	1916	1915
Civil War	$212,211,890	$170,402,020	$152,170,579	$150,431,753	$156,668,771
War with Spain	3,878,189	3,805,129	3,783,680	3,800,226	3,851,701
War of 1812	17,704	21,118	18,702	18,848	22,349
War with Mexico	758,156	883,854	842,055	803,281	925,847
Indian wars	1,561,537	939,916	413,997	475,072	513,706
Regular Establishment	3,701,782	3,776,049	3,666,041	3,625,910	3,535,892
War of 1917	30,031	7,243	.....	.....	.....
Total	222,159,289	179,835,329	160,895,054	159,155,090	165,518,266

EXHIBIT 7.—*Comparative table of the value of an average pension of the different wars for the last five fiscal years.*

	1919	1918	1917	1916	1915
Civil War	$373.39	$287.95	$247.71	$230.01	$226.53
War with Spain	137.28	138.30	133.81	133.47	133.22
War of 1812	218.57	213.31	171.58	163.89	166.71
War with Mexico	256.48	263.60	221.24	186.89	187.68
Indian wars	285.84	221.78	179.44	184.27	181.39
Regular Establishment	192.62	190.30	180.69	180.37	179.21
Average for all wars	355.78	278.00	242.00	224.29	179.12

EXHIBIT 8.—*Comparative number of pensioners on the roll at the close of each of the last five fiscal years, classified as to the character of pension received.*

	1919	1918	1917	1916	1915
DISABILITY PENSIONS.					
Civil war	10,418	31,083	36,287	39,845	45,611
War with Spain	23,382	23,538	24,060	24,101	24,370
Regular Establishment	14,655	15,233	15,702	15,553	15,242
War of 1917	61	24	.....	.....	.....
Total	48,516	69,878	76,049	79,499	85,223
AGE AND SERVICE PENSIONS.					
Act May 11, 1912	260,127	266,443	291,268	320,276	347,081
Act Feb. 6, 1907	579	1,024	1,345	1,727	2,872
Act June 27, 1890	396	421	537	681	1,081
War with Mexico	215	289	384	513	680
Indian wars	3,436	2,421	564	676	786
Total	264,753	270,598	294,098	323,873	352,500
DEPENDENTS.					
Civil War:					
General Law	44,147	46,742	49,039	52,217	56,020
Act June 27, 1890	2,205	2,588	3,125	3,725	3,854
Act Apr. 19, 1908	250,471	243,492	236,725	235,536	235,087
Total	296,823	292,822	288,889	291,478	294,961
War with Spain	4,869	3,975	4,215	4,371	4,542
War of 1812	81	99	109	115	134
War with Mexico	2,741	3,064	3,422	3,785	4,253
Indian wars	2,027	1,817	1,743	1,902	2,046
Regular Establishment	4,563	4,610	4,586	4,549	4,488
War of 1917	54	32	.....	.....	.....
Total	14,335	306,419	302,964	306,200	310,424
Grand total	624,427	646,895	673,111	709,572	748,147

EXHIBIT 9.—*Comparative disbursements during each of the last five years, classified as to the character of pension received.*

	1919	1918	1917	1916	1915
DISABILITY PENSIONS.					
Civil War	$8,012,780.13	$12,149,562.09	$13,444,481.48	$14,879,204.29	$16,562,903.96
War with Spain	3,008,785.41	3,044,661.86	3,087,058.10	3,076,733.88	3,105,807.74
Regular Establishment	2,619,732.40	2,741,434.51	2,744,567.08	2,711,946.09	2,631,955.22
War of 1917	15,708.15	2,681.90	.....	.....	.....
Total	13,657,006.09	17,938,340.36	19,276,106.66	20,667,884.26	22,300,666.92
AGE AND SERVICE PENSIONS.					
Act of May 11, 1912	111,235,827.16	80,294,250.68	85,762,419.32	91,282,255.72	94,780,059.68
Act of Feb. 6, 1907	145,513.56	214,275.98	286,881.16	401,588.66	979,813.51
Act of June 27, 1890	69,799.68	70,421.71	87,968.85	123,573.85	248,228.23
War with Mexico	88,499.09	116,383.00	158,134.59	213,118.76	277,029.20
Indian wars	1,191,146.37	644,756.07	143,099.07	173,415.46	199,772.96
Total	112,730,785.86	81,340,087.44	86,438,502.99	92,193,952.45	96,484,903.58
DEPENDENTS.					
Civil War:					
General law	13,643,896.80	12,771,694.39	9,744,503.83	8,443,232.44	8,965,970.28
Act of June 27, 1890	442,010.45	523,173.37	651,779.91	755,514.49	776,115.84
Act of Apr. 19, 1908	78,662,062.98	64,378,640.92	42,192,544.02	34,546,384.04	34,355,679.93
Total	92,747,970.23	77,673,508.68	52,588,827.76	43,745,130.97	44,097,766.05
War with Spain	869,403.72	760,467.23	696,621.84	723,491.83	745,893.73
War of 1812	17,704.33	21,118.12	18,701.94	18,848.00	22,348.90
War with Mexico	669,657.10	767,471.25	683,920.80	590,161.78	648,817.40
Indian wars	370,391.12	295,160.34	270,898.31	301,656.48	313,933.22
Regular Establishment	1,082,050.43	1,034,613.92	921,473.64	913,964.15	903,936.34
War of 1917	14,323.82	4,561.41	.....	.....	.....
Total	3,023,530.52	80,556,900.95	55,180,444.29	46,293,253.21	46,732,695.64
Grand total	222,159,292.70	179,835,328.75	160,895,053.94	159,155,089.92	165,518,266.14

EXHIBIT 10.—*Amount paid to pensioners, 1790 to 1919, inclusive.*

War of the Revolution	$70,000,000.00
War of 1812	46,049,268.15
Indian wars	16,705,750.41
War with Mexico	52,906,295.05
Civil War	5,299,859,509.39
War with Spain and Philippine Insurrection	65,211,665.71
Regular Establishment	50,242,190.99
War of 1917	37,275.28
Unclassified	16,508,447.41
Total	5,617,520,402.39

EXHIBIT 11.—*Disbursements for pensions and for maintenance of pension system, 1866 to 1919.*

Fiscal year.	Paid as pensions.	Cost, maintenance, and expenses.	Total.	Number of pensioners.
1866	$15,450,549.88	$407,165.00	$15,857,714.88	126,722
1867	20,784,789.69	490,977.35	21,275,767.04	155,474
1868	23,101,509.36	553,020.34	23,654,529.70	169,643
1869	28,513,247.27	564,526.81	29,077,774.08	187,963
1870	29,351,488.78	600,997.86	29,952,486.64	198,686
1871	28,518,792.62	863,079.00	29,381,871.62	207,495
1872	29,752,746.81	951,253.00	30,703,999.81	232,229
1873	26,982,063.89	1,003,200.64	27,985,264.53	238,411
1874	30,206,778.99	966,794.13	31,173,573.12	236,241
1875	29,270,404.76	982,695.35	30,253,100.11	234,821
1876	27,936,209.53	1,015,078.81	28,951,288.34	232,137
1877	28,182,821.72	1,034,459.33	29,217,281.05	232,104
1878	26,786,009.44	1,032,500.09	27,818,509.53	223,998
1879	33,664,428.92	837,734.14	34,502,163.06	242,755
1880	56,689,229.08	935,027.28	57,624,256.36	250,802
1881	50,583,405.35	1,072,059.64	51,655,464.99	268,830
1882	54,313,172.05	1,466,236.01	55,779,408.06	285,697
1883	60,427,573.81	2,591,648.29	63,019,222.10	303,658
1884	57,912,387.47	2,835,181.00	60,747,568.47	322,756
1885	65,171,937.12	3,392,576.34	68,564,513.46	345,125
1886	64,091,142.90	3,245,016.61	67,336,159.51	365,783
1887	73,752,997.08	3,753,400.91	77,506,397.99	406,007
1888	78,950,501.67	3,515,057.27	82,465,558.94	452,557
1889	88,842,720.58	3,466,968.40	92,309,688.98	489,725
1890	106,093,850.39	3,526,382.13	109,620,232.52	537,944
1891	117,312,690.50	4,700,636.44	122,013,326.94	676,160
1892	139,394,147.11	4,898,665.80	144,292,812.91	876,068
1893	156,906,637.94	4,867,734.42	161,774,372.36	966,012
1894	139,986,726.17	3,963,976.31	143,950,702.48	969,544
1895	139,812,294.30	4,338,020.21	144,150,314.51	970,524
1896	138,220,704.46	3,991,375.61	142,212,080.07	970,678
1897	139,949,717.35	3,987,783.07	143,937,500.42	976,014
1898	141,651,879.80	4,114,091.46	148,765,971.26	993,714
1899	138,355,052.95	4,147,517.73	142,502,570.68	991,519
1900	138,462,130.65	3,841,706.74	142,303,887.39	993,592
1901	138,531,483.84	3,868,795.44	142,400,279.28	997,735
1902	137,504,267.99	3,831,378.96	141,335,646.95	999,446
1903	137,759,653.71	3,993,216.79	141,752,870.50	996,545
1904	141,093,571.49	3,849,366.25	144,942,937.74	994,762
1905	141,142,861.33	3,721,832.82	144,864,694.15	998,441
1906	139,000,288.25	3,523,269.51	142,523,557.76	985,971
1907	138,155,412.46	3,309,110.44	141,464,522.90	967,371
1908	153,093,086.27	2,800,963.36	155,894,049.63	951,687
1909	161,973,703.77	2,852,583.73	164,826,287.50	946,194
1910	159,974,056.08	2,657,673.86	162,631,729.94	921,083
1911	157,325,160.35	2,517,127.06	159,842,287.41	892,098
1912	152,986,433.72	2,448,857.31	155,435,291.03	860,294
1913	174,171,660.80	2,543,246.59	176,714,907.39	820,200
1914	172,417,546.26	2,066,507.15	174,484,053.41	785,239
1915	165,518,266.14	1,779,860.30	167,298,126.44	748,147
1916	159,155,089.92	1,656,722.33	160,811,812.25	709,572
1917	160,895,053.94	1,562,854.96	162,457,908.90	673,111
1918	179,835,328.75	1,527,615.61	181,362,944.36	646,895
1919	222,159,292.70	1,433,191.67	223,592,484.37	624,427
Total	5,521,074,958.16	135,898,717.66	5,656,973,675.82	.....

EXHIBIT 12.—*Loss and percentage of loss by death of Civil War soldiers, 1910 to 1919.*

Year.	On roll at beginning of year.	Loss by death during year.	Percentage of loss.
1910	593,961	35,312	5.9
1911	562,615	35,243	6.2
1912	529,881	33,981	6.3
1913	497,263	36,064	7.2
1914	462,379	33,639	7.3
1915	429,354	33,255	7.7
1916	396,370	34,252	8.6
1917	362,277	33,232	9.2
1918	329,226	30,466	9.3
1919	298,808	30,418	10.2

EXHIBIT 13.—*Comparative table of losses and gains to the roll for the last five years classified by causes.*

	1919	1918	1917	1916	1915
Losses:					
By death	49,155	50,860	54,526	55,463	52,329
By remarriage	519	523	549	740	608
Minors attaining age of 16 years	402	434	545	623	715
Failure to claim for 3 years	176	222	258	702	627
Other causes	500	668	353	266	201
Total	50,752	52,707	56,231	57,794	54,480
Gains:					
By original allowance	26,374	23,252	18,496	18,929	17,064
Restoration and renewal	1,910	3,239	1,274	290	324
Total	28,284	26,491	19,770	19,219	17,388
Net loss	22,468	26,216	36,461	38,575	37,092

EXHIBIT 14.—*Comparative table of losses and gains to the rolls for the last five fiscal years, classified by wars.*

	1919				1918				1917				1916				1915			
	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.
Regular Establishment:																				
Army invalids	595	364	231		884	423	461		457	538		81	454	524		70	386	556		170
Army dependents	159	152	7		181	203		22	255	294		39	179	184		5	163	201		38
Navy invalids	317	135	182		278	270	8		190	258		68	212	453		241	168	336		168
Navy dependents	85	55	30		94	96		2	120	118	2		75	131		56	84	110		26
Civil War:																				
Act May 11, 1912—																				
Army	24,290	204	24,086		25,868	1,916	23,952		29,681	1,702	27,979		29,257	3,342	25,915		27,151	445	26,706	
Navy	877	20	857		921	48	873		1,080	51	1,029		1,044	154	890		1,027	46	981	
Act Feb. 6, 1907—																				
Army	118	2	116		309	5	304		389	27	362		1,088	25	1,063		768	43	725	
Navy	7	1	6		17		17		22	2	20		86	4	82		47	3	44	
General law—																				
Army invalids	2,429	26	2,403		5,108	34	5,074		5,162	1,677	3,485		6,260	583	5,677		4,325	27	4,298	
Army nurses	25		25		50	2	48		41		41		23		23		20	3	17	
Army dependents	3,790	1,210	2,580		3,848	1,594	2,254		4,284	1,145	3,139		4,646	879	3,767		4,293	894	3,399	
Navy invalids	43	1	42		84	2	82		71	39	32		79	13	66		61	3	58	
Navy dependents	55	23	32		70	27	43		74	35	39		53	17	36		71	24	47	
Act June 27, 1890—																				
Army invalids	47	4	43		114	5	109		150	12	138		371	10	361		181	14	167	
Army dependents	332	232	100		731	211	520		847	261	586		571	445	126		612	394	218	
Navy invalids	2		2		7		7		6		6		39		39		24	1	23	
Navy dependents	18	5	13		20	3	17		41	27	14		20	17	3		31	11	20	
Act Apr. 19, 1908—																				
Army widows	15,191	22,118		6,927	14,564	20,944		6,380	15,369	16,631		1,262	15,052	15,518		466	12,812	13,079		267
Navy widows	701	438	263		510	897		387	626	553	73		536	519	17		515	412	103	
War with Spain:																				
Army invalids	516	383	133		570	69	501		502	462	40		387	123	264		342	467		125
Army dependents	239	120	119		303	77	226		272	127	145		268	105	163		264	154	110	
Navy invalids	26	8	18		22	1	21		11	10	1		12	7	5		16	12	4	
Navy dependents	14	6	8		16	2	14		16	5	11		15	7	8		14	7	7	
Act July 16, 1918—																				
Army dependents	11	1,050		1,039																
Navy dependents		22		22																
War of 1812:																				
Widows	18		18		10		10		9	3	6		19		19		36		36	
War with Mexico:																				
Survivors	72	1	71		95		95		134	5	129		168	1	167		212		212	
Widows	349	27	322		400	42	358		408	45	363		544	76	468		520	74	446	
Indian wars:																				
Survivors	246	1,226		980	179	2,036		1,857	114	2	112		114	4	110		135	6	129	
Widows	165	377		212	181	255		74	201	42	159		205	61	144		202	66	136	

EXHIBIT 14.—*Comparative table of losses and gains to the rolls for the last five fiscal years, classified by wars*—Continued.

	1919				1918				1917				1916				1915			
	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.
War of 1917:																				
Army invalids	5	23	.....	18	.....	11	.....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Army dependents	5	20	.....	15	.....	19	.....	19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Navy invalids	3	22	.....	19	.....	13	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Navy dependents	2	9	.....	7	.....	13	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	50,752	28,284	31,707	9,239	55,434	29,218	26,216	.....	60,532	24,071	36,461	.....	61,777	23,202	38,575	.....	54,480	17,388	37,092	.....

EXHIBIT 15.—*Appropriations for pensions and disbursements on account thereof for the fiscal year ended June 30, 1919, and unexpended balances at close of year.*

	Pensions.			Fees of examining surgeons, pensions.
	Army.	Navy.	Total.	
APPROPRIATIONS.				
Act of July 2, 1918	$212,350,000.00	$7,650,000.00	$220,000,000.00	$50,000.00
Deficiency act of June 5, 1919	3,000,000.00	.....	3,000,000.00	.....
Repayments to the appropriations	99,967.42	6,496.25	106,463.67	.....
Total to be accounted for	215,449,967.42	7,656,496.25	223,106,463.67	50,000.00
DISBURSEMENTS.				
Amount disbursed by disbursing clerk, Bureau of Pensions	214,518,731.80	7,640,560.90	222,159,292.70	.....
Amount disbursed by chief disbursing clerk, Department of the Interior	.....	.....	.....	11,228.26
Total amount disbursed	214,518,731.80	7,640,560.90	222,159,292.70	11,228.26

BALANCES JUNE 30, 1919.				
Remaining in the hands of disbursing clerk, Bureau of Pensions	931,235.62	15,935.35	947,170.97	
Remaining in the hands of chief disbursing clerk, Department of the Interior				271.74
Remaining in the United States Treasury				38,500.00
Available balance	931,235.62	15,935.35	947,170.97	38,771.74
Total accounted for	215,449,967.42	7,656,496.25	223,106,463.67	50,000.00

In addition to the above there were disbursed during the fiscal year ended June 30, 1919, the following sums chargeable to the appropriation for the fiscal year ended June 30, 1918.

Fees of examining surgeons, pensions, by chief disbursing clerk, Department of the Interior	$6,775.40
Fees of examining surgeons, pensions, by Treasury settlements	146.60
Total	6,922.00

Of the amount, $7,640,560.90, disbursed for Navy pensions, $106,732.04 was paid from the Navy pension fund.

EXHIBIT 16.—*Number and amount of first payments in original, increase, restoration, and other cases made during the fiscal year ended June 30, 1919.*

Classes.	Original.		Increase and reissue.		Supplemental.		Restoration and renewal.		Total.	
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.
Regular Establishment:										
Army—										
Invalids	341	$79,607.08	108	$4,101.17			17	$1,262.09	466	$84,970.34
Widows, etc	144	43,251.73	11	1,184.09			2	283.33	157	44,719.15
Navy—										
Invalids	103	13,207.77	36	2,232.30			26	631.73	165	16,071.80
Widows, etc	57	14,388.42	2	189.40					59	14,577.82
Civil War:										
Act Feb. 6, 1907—										
Army							1	21.73	1	21.73
Act May 11, 1912—										
Army	188	82,147.16	29,158	2,495,243.18	2	$21.17	238	15,979.04	29,586	2,593,390.55
Navy	21	8,897.36	1,224	119,680.03			8	470.40	1,253	129,047.79
General law—										
Army—										
Invalids	18	6,824.89	626	35,416.19	4	2.38	26	5,258.89	674	47,502.35
Widows, etc	338	55,526.73	49	5,147.25			837	271,963.14	1,224	332,637.12
Navy—										
Invalids	1	50.00	56	4,425.84			2	14.50	59	4,490.34
Widows	14	2,688.69	3	168.27			4	1,047.03	21	3,903.99

EXHIBIT 16.—*Number and amount of first payments in original, increase, restoration, and other cases made during the fiscal year ended June 30, 1919*—Continued.

Classes.	Original.		Increase and reissue.		Supplemental.		Restoration and renewal.		Total.	
	Number	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.
Civil War—Continued.										
Act June 27, 1890—										
Army—										
Invalids	5	$1,512.07	1	$25.67					6	$1,537.74
Minors, etc	213	80,410.62	1	45.60			7	$1,004.80	221	81,461.02
Navy—										
Invalids										
Minors, etc	12	4,763.93	1	4.27					13	4,768.20
Act Apr. 19, 1908—										
Army—Widows	21,485	5,327,051.14	57	12,330.76	4	$3,814.67	936	315,546.30	22,482	5,658,742.87
Navy—Widows	409	104,035.20	2	247.93			7	2,131.59	418	106,414.72
War with Spain:										
Army—										
Invalids	372	33,236.46	137	6,072.98			9	349.00	518	39,658.44
Widows, etc	89	15,815.50	8	977.74					97	16,793.24
Navy—										
Invalids	7	257.64	1	13.73					8	271.37
Widows, etc	1	19.20	1	325.13					2	344.33
Act July 16, 1918:										
Army—Widows, etc	687	61,867.41							687	61,867.41
Navy—Widows, etc	14	1,077.14							14	1,077.14
War of 1812:										
Widows			1	5.00					1	5.00
War with Mexico:										
Survivors	1	107.60	19	765.60					20	873.20
Widows, etc	27	10,052.72	24	966.21			1	75.00	52	11,093.93
Indian wars:										
Survivors	1,236	494,620.28	4	471.66			3	294.27	1,243	495,386.21
Widows	372	84,770.79	7	109.89					379	84,880.68
War of 1917:										
Army—										
Invalids	22	4,487.46							22	4,487.46
Widows, etc	19	5,011.59							19	5,011.59
Navy—										
Invalids	22	4,439.46							22	4,439.46
Widows, etc	7	2,287.37							7	2,287.37
Total	26,225	6,542,413.41	31,537	2,690,149.89	10	3,838.22	2,124	616,332.84	59,896	9,852,734.36

AVERAGE VALUE OF FIRST PAYMENTS, 1919.

In original cases	$249.47
In original regular establishment cases	233.26
In original act May 11, 1912, cases	435.62
In original general law—Civil War cases	175.44
In original act June 27, 1890, cases	376.89
In original act April 19, 1908, cases	248.06
In original War with Spain cases	95.96
In original War with Mexico cases	362.87
In original Indian wars cases	360.32
In original War of 1917 cases	231.79
In increase and reissue cases	85.30
In all cases	164.49

EXHIBIT 17.—*Number of inmates of the United States Soldiers' Home, St. Elizabeths' Hospital, and the various branches of the National Home for Disabled Volunteer Soldiers, and the amount paid such inmates from July 1, 1918, to June 30, 1919.*

Institution and location.	July 1, 1918, to Sept. 30, 1918.		Oct. 1, 1918, to Dec. 31, 1918.		Jan. 1, 1919, to Mar. 31, 1919.		Apr. 1, 1919, to June 30, 1919.		Total.
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	
Battle Mountain Sanitarium, Hot Springs, S. Dak	375	$36,303.92	354	$33,996.77	395	$37,539.63	395	$39,223.54	$147,063.86
Central Branch, National Military Home, Ohio	2,469	236,519.79	2,693	262,578.59	2,832	275,691.77	2,621	257,574.03	1,032,355.18
Danville Branch, National Home, Danville, Ill	1,515	143,797.87	1,565	149,105.16	1,576	152,860.75	1,455	143,201.41	588,965.19
Eastern Branch, National Soldiers' Home, Me	976	94,763.07	988	97,464.99	993	99,750.95	944	95,011.72	386,990.73
Marion Branch, National Military Home, Ind	1,174	109,339.81	1,228	117,889.40	1,217	117,778.72	1,141	112,464.49	457,472.42
Mountain Branch, National Soldiers' Home, Tenn	972	90,688.37	1,675	163,136.77	1,795	175,913.43	1,572	152,850.79	582,589.36
Northwestern Branch, National Home, Wis	1,077	102,121.99	1,042	99,606.72	1,155	102,133.61	1,029	100,846.21	404,708.53
Pacific Branch, Soldiers' Home, Calif	2,859	280,103.36	2,788	279,070.56	2,999	302,834.78	2,807	286,216.04	1,148,224.74
St. Elizabeths' Hospital, Washington, D. C	217	16,098.90	231	20,147.70	210	16,028.50	189	14,275.50	66,550.60
Southern Branch, National Soldiers' Home, Va	1,560	151,879.24	39	2,550.41	.....	[1]	.....	[1]	154,429.65
United States Soldiers' Home, Washington, D. C	862	61,345.37	836	62,049.34	834	59,781.63	816	58,029.88	241,206.22
Western Branch, National Military Home, Kans	2,037	197,317.34	2,039	200,732.74	2,087	207,863.73	2,009	203,134.29	809,048.10
Total	16,093	1,520,270.03	15,478	1,488,329.15	16,090	1,548,177.50	14,978	1,462,827.90	6,019,604.58

[1] No payment after Nov. 30, 1918.

Total amount of attorney fees paid in cases where the pensioners were inmates of the above homes during the fiscal year ended June 30, 1919, was $890, making the entire disbursement on account of homes $6,020,494.58.

Number of admissions, discharges, and transfers to and from the various branches of the National Military Home during the fiscal year ended June 30, 1919, 11,576.

EXHIBIT 18.—*Certificates issued during the fiscal year ended June 30, 1919.*

Classes.	Original.	Increase.	Reissue.	Restoration.	Renewal.	Supplemental.	Total.
General law:							
Civil War, Army—							
Invalids	14	685	527	5	25	86	1,342
Nurses							
Widows, etc	371	21	45		61	3	501
Civil War, Navy—							
Invalids	1	16	15			6	38
Widows, etc	7		7				14
War with Spain, Army—							
Invalids	374	265	17	2	12		670
Nurses	2						2
Widows, etc	89	8	3		7		107
War with Spain, Navy—							
Invalids	8	2	1				11
Widows, etc	2						2
Regular Establishment, Army—							
Invalids	342	205	26	7	23		603
Widows, etc	144	4	3		1		152
Regular Establishment, Navy—							
Invalids [1]	107	60	34	8	39		248
Widows, etc	56	2		1			59
War of 1917, Army—							
Invalids	28						28
Widows, etc	21						21
War of 1917, Navy—							
Invalids	17	1					18
Widows, etc	8						8
Act of June 27, 1890:							
Civil War, Army—							
Invalids	5	1					6
Widows, etc	235		3		15	6	259
Civil War, Navy—							
Invalids							
Widows, etc	4		1				5
Act of Feb. 6, 1907:							
Civil War, Army—Soldiers	2		2	1		1	6
Civil War, Navy—Sailors	1						1
Mexican War—Survivors							
Act of Apr. 19, 1908:							
Civil War, Army—Widows	360		8	3	7	1	379
Civil War, Navy—Widows	12						12
Act of May 11, 1912:							
Civil War, Army—Soldiers	190	3,958	17,087	7	2,455	13	23,710
Civil War, Navy—Sailors	18	122	230		40		410
Mexican War—Survivors			2				2
Act of Apr. 19, 1908, amended by act of Sept. 8, 1916:							
Civil War, Army—Widows	19,939	1	5		6		19,951
Civil War, Navy—Widows	399		1				400
Act of Sept. 8, 1916, sec. 2:							
Civil War, Army—Former widows	1,312		2		1,771		3,085
Civil War, Navy—Former widows	30				15		45
Mexican War—Former widows					1		1
Act of Jan. 29, 1887, etc.							
Mexican War—							
Survivors		6					6
Widows	24	32	1				57
Act of July 27, 1892, etc.:							
Indian Wars—							
Survivors	2	11			1		14
Widows	31	18					49
Act of Mar. 4, 1917:							
Indian Wars—							
Survivors	1,325		7				1,332
Widows	349						349
Old wars—							
Invalids		3					3
Widows	3	1					4
War of 1812—Widows		1					
Act of July 16, 1918:							
Spanish War—							
Army—Widows	1,051						1,051
Navy—Widows	22						22
Total	26,905	5,423	18,027	34	4,479	116	54,984
Reissues in lieu of lost certificates							1,335
Accrued pension orders							20,103
Widows' increase orders, act Sept. 8, 1916							81
Grand total							76,503

[1] Concurrent originals, 8.

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1919.*

Rate.	Regular Establishment.		Civil War.							War with Spain.	
	Invalids.	Widows, etc.	Act May 11, 1912.	Act Feb. 6, 1907.	General law.		Act June 27, 1890.		Act Apr. 19, 1908.	Invalids.	Widows, etc.
					Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.		
$2.00	1	2				1		1			1
3.00	4										
4.00	2										
5.00	9										
6.00	3,936				175		23			8,844	1
6.25										4	
7.50	14				3					29	
8.00	2,055				92	4	44			3,938	
8.50	1									32	
9.00	2										
9.50	1										
10.00	1,425				86		29			2,626	
10.50	1										
11.00	3										
11.25										23	
11.50	1										
12.00	1,600	2,708		352	139	644	171	2,204		2,279	3,478
12.50	12				1					10	
12.75	1				2					35	
13.00	1		1		1					1	
13.50			5								
14.00	622		3		83					876	
14.50			1								
15.00	32	34		77	8	11				67	7
15.50			4								
15.68	1										
16.00	76		3		18					31	
16.50	1		2							1	
16.68	1										
17.00	1,675	55			285	29				1,586	14
17.50	4										
17.86	1										
18.00	13		2							1	
18.18	1										
18.50	2										
18.75					1					2	
19.00			7								
19.18	2										
19.50	3										
19.84½	1										
20.00	70	102	2	149	34	598				106	5
20.36	1										
20.50	1										
20.68	3										
21.00	1		2		1						
21.25	10									3	
21.50			2								
21.68	1										
21.75	1										
22.00	57				46					58	
22.50	2		15							4	
22.59½	1										
22.94½	1										
23.14½	1										
23.49½	1										
23.54	1										
23.68	1										
24.00	930	2	1		574					586	
24.99	1										
25.00	57	972	2		47	38,109			250,471	24	1,031
25.14½	1										
25.50	1										
25.63½	1										
26.00	1										
26.29	1										
26.36	1										
26.64	1										
26.99½	2										
27.00	25				50					19	

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1919*—Continued.

Rate.	Regular Establishment.		Civil War.							War with Spain.	
					General law.		Act June 27, 1890.		Act Apr. 19, 1908.		
	Invalids.	Widows, etc.	Act May 11, 1912.	Act Feb. 6, 1907.	Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.	Invalids.	Widows, etc.
$27.10	1										
27.36	1										
27.50	2									1	
27.89½	1										
28.00	1										
28.25	3										
28.29	3										
28.50	1										
28.64½	1										
28.68	1										
29.69½	1										
29.00										1	
29.18	2									1	
29.36	1										
29.39	1										
29.94	1										
30.00	761	229	43,017		1,315	156				409	16
30.50	1										
30.68	1										
31.00	2										
31.04	2										
31.18	1										
31.24	2										
31.25	1										
31.50	1										
31.68			1								
31.84	1										
32.00	3		45,119								
32.18										1	
32.36	1										
32.50	1										
32.94½	1										
33.00	3										
33.25	1										
33.50	1		2								
33.75			1								
34.00	1										
34.18	1										
34.50	3										
34.64½	1										
34.86	1										
35.00	1		29,669								
35.04½	1										
35.68	1										
36.00	4				17					5	
36.18	1										
36.59½	1										
36.64½	1										
37.18										1	
37.19½	1										
37.36	1										
37.50	15										
37.68	2										
37.75			1								
37.86	1										
37.94	1										
38.00	1		26,547								
38.14	1										
38.19	1										
38.36	1										
39.00			1								
39.25	1										
39.50			1								
39.75	1										
39.99½	1										
40.00	190		115,484		1,169					89	
40.50	1										

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1919*—Continued.

Rate.	Regular Establishment.		Civil War.							War with Spain.	
					General law.		Act June 27, 1890.		Act Apr. 19, 1908.		
	Invalids.	Widows, etc.	Act May 11, 1912.	Act Feb. 6, 1907.	Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.	Invalids.	Widows, etc.
$40.68	1										
40.74½	1										
40.99½	1										
41.00	2										
41.64½				1							
41.68	1										
41.79	1										
42.00			8								
42.09½	1										
42.89½	1										
43.00			2								
43.69	1										
44.00	1		1								
44.36	1										
44.49	1										
44.59	1										
44.86	1										
45.00			11		1						
45.09½	1										
45.14½	2										
45.89	2										
46.00	98		2		589					55	
46.44	3										
46.50	2		2								
46.79½	1										
46.94	1										
47.00	1										
47.50			4								
47.54	1										
48.00	2		13								
48.78	1										
48.84	1										
48.86										1	
50.00	87		171		441					59	
50.35	1										
50.50			2								
52.00	1										
52.09½	1										
52.44	1										
52.59½	2										
53.54½	2										
53.64½	1										
54.00	2		3								
54.44	1										
55.00	36				665					27	
55.19	1										
55.89	1										
56.00	1		2		1						
56.54	1										
56.99	1										
57.50	1										
57.89	2										
58.00	1										
58.25			1								
58.44	1										
58.50	1		2								
58.99	1										
59.00	1		1								
60.00	2		1								
60.44	2										
60.49½	1										
61.04½	1										
61.44	1										
62.14½	1										
62.36	1										
62.69½	1										
62.86	1										

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1919*—Continued.

Rate.	Regular Establishment.		Civil War.							War with Spain.	
	Invalids.	Widows, etc.	Act May 11, 1912.	Act Feb. 6, 1907.	General law.		Act June 27, 1890.		Act Apr. 19, 1908.	Invalids.	Widows, etc.
					Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.		
$63.00	1										
63.44	3										
63.50			2								
64.50	1										
65.00					2						
66.50			2								
70.44	1										
72.00	63				178					45	
73.50			2								
74.09½	1										
80.00	2										
81.44	1										
82.00					1						
82.50	1										
94.04½	1										
100.00	42				203					10	
100.08										1	
117.14½	1										
Total.	14,128	4,104	260,127	579	6,228	39,552	267	2,205	250,471	21,891	4,553

In addition to the above there were at the close of the year:

Army nurses, 91 at $12.

War of 1812: Widows—28 at $12, 45 at $20.

War with Mexico: Survivors—5 at $20, 1 at $25, 172 at $30, 10 at $32, 7 at $35; 3 at $38, 8 at $40, 1 at $50; widows, etc.—1 at $8, 425 at $12, 1,892 at $20, 259 at $25.

Indian wars: Survivors—1 at $16, 3,384 at $20, 13 at $30; widows—1,913 at $12, 3 at $20, 48 at $25.

War of 1917: Invalids—8 at $6, 6 at $8, 4 at $10, 14 at $12, 1 at $13, 1 at $14, 10 at $17, 2 at $24, 1 at $27, 3 at $30, 6 at $40, 2 at $46, 1 at $72, 1 at $100; widows, etc.—1 at $2, 27 at $12, 1 at $15, 2 at $17, 3 at $20, 13 at $25, 7 at $30.

EXHIBIT 20.—*Statement showing by classes the different monthly rates paid to pensioners under special acts of Congress and the number at each rate on the roll June 30, 1919.*

Rate.	Regular Establishment.		Civil War.			War with Spain.		War of 1812.	War with Mexico.		Indian Wars.		War of 1917.
	Invalids.	Widows, etc.	Invalids.	Nurses.	Widows, etc.	Invalids.	Widows, etc.	Widows.	Survivors.	Widows.	Survivors.	Widows.	Invalids.
$6.00	3		3			12							
8.00	6		10			43				1	6		
10.00	7		4		2	40							
12.00	238	98	154	28	757	823	86			29		28	
12.50						1							
14.00	5		5		3	8							
15.00	2	3	9		3	31	1						
16.00	7					12					19		
17.00	56	3	10			205							
17.50			1										
18.00	4	1	7		33	5	1						
20.00	29	12	38	4	30	60	11	2	2	109	4	31	
21.00			23										
22.00		1				2							
22.50			1										
24.00	72	1	356	5	7	109		5					
25.00	1	108	12	1	3,336	2	170	1		18		1	
27.00			12										
30.00	62	66	1,030		153	93	19		3	3	8		1
32.00			12										
33.00					2								
34.00	1												
35.00		30	1		17		5			1			
36.00	4		615		1	5							
37.00		1			191								
40.00	11	63	1,081		14	11	9		2	2	1		
45.00	1	1	12										
46.00	2		12			4							
49.00					3								
50.00	14	60	745		34	22	13		1	1			
55.00			11			1							
60.00	1	1	3										
65.00			3										
67.00			1										
72.00	1		11		1	1							
75.00		1			2								
100.00		7	8		5	1							
125.00		1											
166.66⅔					1								
208.33⅓		1											
416.66⅔							1						
Total	527	459	4,190	38	4,595	1,491	316	8	8	164	38	63	1

EXHIBIT 21.—*Total number of certificates issued on account of all claims allowed since the establishment of the pension system (to include June 30, 1919).*

Original soldiers' and sailors' claims allowed:		
Revolutionary War		52,504
War of 1812		25,723
Mexican War		20,668
Indian wars		9,809
Old wars, prior to Mar. 4, 1861		9,486
Army, since Mar. 4, 1861 (exclusive of War with Spain)		1,136,880
Navy, since Mar. 4, 1861 (exclusive of War with Spain)		44,902
War with Spain—		
Army	30,972	
Navy	1,097	
		32,069
Total		1,332,041
Reissue and increase claims allowed:		
Revolutionary War	2,992	
Mexican War (approximated)	20,697	
Indian wars (approximated)	665	
Army (approximated and exclusive of War with Spain)	3,665,618	
Navy (approximated and exclusive of War with Spain)	132,135	
War with Spain—		
Army	15,807	
Navy	439	
	16,246	
		3,838,353
Total soldiers' and sailors' claims allowed		5,170,394
Original widows' claims allowed:		
Revolutionary War widows		22,644
Revolutionary War daughters (special acts)		18
War of 1812		35,520
Mexican War		16,274
Indian wars		8,986
Old wars, prior to Mar. 4, 1861		8,042
Army, since Mar. 4, 1861 (exclusive of War with Spain)		857,405
Navy since Mar. 4, 1861 (exclusive of War with Spain)		27,188
War with Spain—		
Army	8,810	
Navy	455	
		9,265
Total		985,342
Reissue and increase claims allowed:		
War with Spain (Army, 243; Navy, 27)	270	
All other acts (approximated)	71,034	
		71,304
Total widows' claims allowed		1,056,646
Approximated number of issues on account of all claims allowed:		
Soldiers and sailors		5,170,394
Widows		1,056,646
Total		6,227,040

EXHIBIT 22.—*Number of pensions granted by special acts each Congress since Mar. 4, 1861.*

Thirty-seventh (1861–1863)	12	Fifty-third (1893–1895)	119
Thirty-eighth (1863–1865)	27	Fifty-fourth (1895–1897)	378
Thirty-ninth (1865–1867)	138	Fifty-fifth (1897–1899)	691
Fortieth (1867–1869)	275	Fifty-sixth (1899–1901)	1,394
Forty-first (1869–1871)	85	Fifty-seventh (1901–1903)	2,171
Forty-second (1871–1873)	167	Fifty-eighth (1903–1905)	3,535
Forty-third (1873–1875)	182	Fifty-ninth (1905–1907)	6,080
Forty-fourth (1875–1877)	98	Sixtieth (1907–1909)	6,600
Forty-fifth (1877–1879)	280	Sixty-first (1909–1911)	9,649
Forty-sixth (1879–1881)	96	Sixty-second (1911–1913)	6,350
Forty-seventh (1881–1883)	216	Sixty-third (1913–1915)	5,061
Forty-eighth (1883–1885)	598	Sixty-fourth (1915–1917)	5,885
Forty-ninth (1885–1887)	856	Sixty-fifth (1917–1919)	3,641
Fiftieth (1887–1889)	1,015		
Fifty-first (1889–1891)	1,388	Total	56,924
Fifty-second (1891–1893)	217		

EXHIBIT 23.—*Pension claims pending June 30, 1919.*

Act of May 11, 1912	1,865
Other acts	35,676
Total	37,541
Act of Mar. 3, 1899, deserted wives	50
Act of Mar. 2, 1895:	
Accrued	15,064
Reimbursement	1,856
Cases before Board of Pension Appeals	162

EXHIBIT 24.—*Revolutionary War archives.*

Total pension claims on file:	
Admitted	78,284
Rejected	10,319
Bounty land claims	8,843
Calls at the bureau for the examination of records, 1919	541
Certificates of service furnished, 1919	1,209
Negative replies given, 1919	1,425
Answers to miscellaneous matters, 1919	518
Claims drawn from the files for consideration, 1919	9,842

EXHIBIT 25.—*Record cards completed to June 30, 1919, in Certificate Division.*

[This table shows all the different series of certificate numbers and the highest number given therein.]

Series.	Number of cards completed.	Highest certificate number given in series.	Remarks.
Old wars:			
Invalids	9,486	9,486	
Widows	0	8,042	
War of 1812:			
Survivors	25,723	25,723	Service pensions.
Widows	35,520	35,520	
Indian wars:			
Survivors	9,809	9,809	Do.
Widows	8,986	8,986	
Mexican War:			
Survivors	20,668	20,668	Do.
Widows	16,274	16,274	
Navy:			
Invalids	29,888	42,035	Merged with Army series Aug. 12, 1910.
Widows	21,618	21,618	Merged with Army series Aug. 13, 1910.
Invalids (Army and Navy) [1]	11,279	1,181,279	
Widows (Army and Navy) [1]	117,160	872,242	
Total	306,411		

[1] There is no separate series of certificate numbers on account of War with Spain and Regular Establishment allowances, which are included in the invalid and widow Army and Navy series.

Revolutionary War soldiers pensioned	52,504
Revolutionary War widows pensioned	22,644
Revolutionary War daughters pensioned (special acts)	18

Old war invalid series of certificate numbers run from No. 1 to No. 9486.
Civil War invalid series of certificate numbers begin with No. 9487.

EXHIBIT 26.—*Carding of records in Record Division.*

Service record cards written	11,966	
Numerical record cards written (completed)	15,170	
Alphabetical record cards written	10,369	
Total		37,505
Cards canceled through consolidation and correction		4,423
Net total		33,082
Numerical record cards written (incomplete)		46,103
Grand total cards written to June 30, 1919:		
Service record cards	2,530,724	
Numerical record cards (completed)	478,928	
Alphabetical record cards	2,774,288	
		5,783,946
Total cards canceled through consolidation and correction		377,200
Grand total completed cards on file		5,406,734
Numerical record cards (incomplete)		498,473
Act May 11, 1912:		
Cards filed—		
Original		16,299
Increase		7,032
Cards stamped "Dead"		26,129
Cards canceled		4,020
Total on file		444,690

Examining Surgeons.

Exhibit 27.—*Report for fiscal year ended June 30, 1919.*

States.	Examining boards.	Examinations by boards.	Single surgeons.	Examinations by single surgeons.	Expert surgeons.	Examinations by experts.
Alabama	8	17	1	.....	7	1
Arizona	1	6	2	.....	2	1
Arkansas	18	22	6	4	8	3
California	19	129	4	1	20	14
Colorado	18	33	5	1	12	3
Connecticut	9	10	1	.....	5	1
Delaware	3	3	.....	.....	2	.....
District of Columbia	3	71	.....	.....	6	15
Florida	9	12	2	.....	7	4
Georgia	7	23	4	1	12	5
Idaho	5	3	4	1	3	.....
Illinois	88	139	4	2	30	21
Indiana	85	177	2	.....	21	22
Iowa	74	28	6	2	16	2
Kansas	65	62	6	1	21	11
Kentucky	66	103	3	.....	11	19
Louisiana	3	8	2	1	6	.....
Maine	23	22	2	.....	12	4
Maryland	9	12	1	.....	5	3
Massachusetts	22	51	.....	.....	15	6
Michigan	53	71	3	1	19	5
Minnesota	29	25	15	3	11	.....
Mississippi	7	5	1	.....	8	1
Missouri	80	65	3	.....	30	10
Montana	4	5	5	1	8	1
Nebraska	46	22	6	1	7	1
Nevada	3	1	.....	.....	1	.....
New Hampshire	12	11	.....	.....	2	.....
New Jersey	10	24	.....	.....	2	1
New Mexico	4	22	7	.....	3	.....
New York	59	110	1	.....	28	26
North Carolina	13	8	8	5	8	2
North Dakota	4	5	1	.....	4	.....
Ohio	87	188	4	1	34	14
Oklahoma	35	32	1	.....	13	2
Oregon	12	18	6	1	10	3
Pennsylvania	72	119	3	.....	23	11
Rhode Island	2	4	.....	.....	2	3
South Carolina	3	7	2	4	4	1
South Dakota	20	6	8	1	10	1
Tennessee	39	88	2	.....	14	8
Texas	12	33	6	3	17	6
Utah	2	3	.....	.....	2	1
Vermont	14	10	1	1	7	2
Virginia	7	20	.....	.....	10	.....
Washington	13	22	4	1	7	1
West Virginia	33	19	2	1	9	11
Wisconsin	46	21	5	1	14	3
Wyoming	2	3	5	1	1	.....
Total	1,258	1,898	154	41	529	240

EXHIBIT 28.—*Special examinations, number made, cost thereof, etc., during fiscal year ended June 30, 1919.*

Appropriated by Congress to investigation of pension cases		$90,000.00
Expenses of special examiners:		
Per diem, in lieu of subsistence	$66,484.00	
Transportation and incidentals	22,962.21	
Miscellaneous	553.79	
Total		90,000.00
Average number of special examiners		46
Number of depositions taken		34,316
Number of reports submitted		6,134
Average cost per report		$14.67
Recoveries made by special examiners		745.63
Review:		
Reports reviewed and referred for further examination		2,989
Submitted to Board of Review for final action		2,874
Submitted to other divisions		968
Total number of reviews made in division		6,831
Cases:		
In Special Examination Division, July 1, 1918	1,968	
Received during the year	3,709	
		5,677
Disposed of during the year		3,802
Number on hand June 30, 1919		1,875

EXHIBIT 29.—*Appealed cases, year ending June 30, 1919.*

	Awaiting action of Board of Review.	Awaiting action of Secretary.	Total.
On hand July 1, 1918	7	305	312
Received during year 1918-19	611		611
	618	305	923
Referred to secretary, 507; receded, 55; returned, 48	610	507	103
	8	812	820
Affirmed, 582; reversed, 53; dismissed, 13; vacated, 10		658	658
On hand June 30, 1919	8	154	162

REPORT OF THE COMMISSIONER OF PATENTS

ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
Washington, D. C., August 29, 1919.

SIR: I have the honor to submit herewith the following report of the business of the United States Patent Office for the fiscal year ended June 30, 1919:

Applications received during fiscal year ended June 30, 1919.

Applications for patents for inventions	62,755
Applications for patents for designs	2,787
Applications for reissues of patents	226
Applications for registration of trade-marks	8,561
Applications for registration of labels	934
Applications for registration of prints	394
Total applications	75,657
Disclaimers	19
Appeals on the merits	1,915
Notices of opposition	144
Total applications, disclaimers, appeals, and notices of opposition	77,735

Applications for patents for inventions.

Year ended June 30—		Year ended June 30—	
1910	63,365	1915	66,497
1911	65,365	1916	67,348
1912	69,236	1917	68,690
1913	67,986	1918	62,399
1914	69,311	1919	62,755

Application for patents, including reissues, designs, trade-marks, labels, and prints.

Year ended June 30—		Year ended June 30—	
1910	72,533	1915	79,116
1911	74,677	1916	80,621
1912	79,747	1917	81,538
1913	78,411	1918	73,307
1914	81,539	1919	75,657

Applications awaiting action.

June 30—		June 30—	
1914	22,283	1917	16,058
1915	18,270	1918	14,769
1916	16,559	1919	17,735

Patents withheld and patents expired.

	1918	1919
Letters patent withheld for nonpayment of final fees	9,513	8,354
Applications allowed awaiting payment of final fees	16,235	15,210
Patents expired	24,593	26,030
Applications in which issue of patent is deferred under section 4885, Revised Statutes	141	848
Applications in process of issue	3,588	3,527

Patents granted and trade-marks, labels, and prints registered.

Class.	1915	1916	1917	1918	1919
Letters patent	42,734	44,153	42,328	39,214	37,259
Design patents	1,489	1,761	1,686	1,146	1,355
Reissue patents	179	217	165	166	205
Trade-marks	6,919	6,109	6,126	4,844	3,766
Labels	762	833	781	516	572
Prints	321	402	342	192	196
Total	52,404	53,477	51,428	46,078	43,353

Receipts from all sources, fiscal year ended June 30, 1919.

Applications, first fees	$939,362.00
Designs	41,153.50
Reissues	6,750.00
Trade-marks	85,408.00
Final fees	746,554.50
Appeals and oppositions	23,080.00
Disclaimers	190.00
Coupons	57,503.20
Drawings	4,597.29
Recording assignments	25,727.66
Labels	5,484.00
Prints	2,183.00
Court costs	92.28
Copies of records	156,990.72
Unapplied	20.00
Official Gazette and other publications	18,254.02
Total	2,113,350.17

Expenditures fiscal year ended June 30, 1919.

Salaries	$1,350,831.67
Scientific library	2,931.59
Transportation of patents to foreign countries	1,139.70
Postage on foreign mail	1,295.00
Stationery	11,584.87
Furniture and sundries	9,181.11
Ice	241.80
Washing towels	136.65
Winding clocks	211.20
Telephones	418.30
Telegraphing	30.49
Investigating public use	493.25
Photolithographing:	
Current issue	50,232.71
Reproductions	68,645.20
Foreign patents	948.60
Photographic printing	4,011.56
Photostat supplies	10,846.93
Dry mounts	5,315.00

Printing and binding:	
Official Gazette	$131,829.73
Indexes	3,789.26
Specifications	391,553.64
Miscellaneous	23,141.59
International Convention for Protection of Industrial Property (estimated)	750.00
Coal	14,533.50
Fixed charges not enumerated	197.59
Total	2,084,290.94
Increase in compensation	94,287.36
Grand total	2,178,578.30

Receipts and expenditures.

Expenditures	$2,178,578.30
Receipts from all sources	2,113,350.17
Net deficit	65,228.13
Total net surplus to date	8,125,887.60

Comparative statement.

June 30—	Receipts.	Expenditures.	Surplus.
1910	$2,022,043.26	$1,953,549.76	$68,493.50
1911	1,987,778.58	1,957,001.85	30,776.73
1912	2,094,059.50	2,019,236.01	74,823.49
1913	2,082,490.23	1,924,459.42	158,030.81
1914	2,169,988.95	1,929,132.52	240,856.43
1915	2,270,937.68	2,087,581.26	183,356.42
1916	2,334,030.48	2,051,656.79	282,373.69
1917	2,317,519.72	2,095,138.68	222,381.40
1918	2,103,660.56	2,131,616.18	−27,955.63
1919	2,113,350.17	2,178,578.30	−65,228.12

Appellate Work.

Interferences declared	1,264
Interferences disposed of before final hearing	930
Interferences heard	302
Interferences disposed of	277
Interferences awaiting decision	52

Oldest case awaiting action, Mar. 11, 1919.

Appeals to examiners in chief in interference cases	168
Ex parte appeals to examiners in chief	1,280
Total	1,448
Appeals in interference cases disposed of	185
Ex parte appeals disposed of	1,175
Total	1,360
Interference cases awaiting action	95
Ex parte cases awaiting action	468
Total	503

Oldest interference case awaiting action, Nov. 19, 1918.
Oldest ex parte case awaiting action, Jan. 13, 1919.

Appeals to commissioner in interference cases	103
Appeals to commissioner in opposition cases	21
Appeals to commissioner in cancellations	1

Ex parte appeals to commissioner	198
Interlocutory appeals to commissioner	133
Ex parte appeals in trade-mark cases	120
Total	576
Petitions to commissioner	3,574
Total	4,150

Cases disposed of by commissioner:	
Appeals in interference cases	123
Appeals in opposition cases	22
Appeals in cancellation cases	3
Ex parte appeals	162
Interlocutory appeals	125
Ex parte appeals in trade-mark cases	86
Total	521
Petitions to commissioner	3,501
Total	4,022

Appeals to Court of Appeals, District of Columbia:	
Ex parte cases	20
Interference cases	58
Opposition cases	10
Cancellation cases	3
Total	91

GENERAL STATEMENT.

During the year 65,768 applications for patents, including reissues and designs, and 143,778 amendments in pending cases were filed. The number of letters constituting the miscellaneous correspondence received and indexed was 250,262.

The number of printed copies of specifications of patents sold was 2,163,057, for which a revenue of $107,152.85 was received by the Office, this amount being a decrease of $19,941.15 from the receipts of last year. A total of 991,976 copies of patents were shipped to foreign Governments. The whole number of copies of patents furnished for sale for governmental use and for foreign Governments was 3,411,833.

The Office received for record 29,973 deeds of assignment, containing on an average 466.29 words per deed.

Typewritten copies of 18,253,700 words and photostatic copies of 9,196,900 words of records aggregating 27,450,600 words were furnished at 10 cents per hundred words, and for certifying to these copies $1,502.50, for which the Office received $28,953.10.

For 6,616 certified printed copies, etc., the Office received $5,267.40.

For 107,496 photostatic copies of foreign patents etc., the Office received $21,015.90, and for 56,307 photographic copies $8,906.45.

For all of this class of work the Office received a total of $64,142.85.

The Office furnished to other departments, without charge, 5,062 photostatic copies, and made for its own use 22,389.

Respectfully submitted.

J. T. NEWTON,
Commissioner of Patents.

The SECRETARY OF THE INTERIOR.

STATEMENT OF THE COMMISSIONER OF EDUCATION.

STATEMENT OF THE COMMISSIONER OF EDUCATION.

DEPARTMENT OF THE INTERIOR,
BUREAU OF EDUCATION,
Washington, D. C., September 1, 1919.

SIR: I have the honor to submit the following statement of the operations of this office for the fiscal year ended June 30, 1919, together with recommendations for the extension and improvement of its work.

Section I.

STATISTICS.

Considerable progress has been made in the work of securing uniformity in educational statistics and cooperation in the collection of statistics needed by the bureau. With the assistance of a committee representing the national conference of chief State school officers, the blanks used by the bureau in collecting statistics were revised and submitted to the chief State school officer in each State for criticism and for suggestions for improvement. The blanks were again revised in accordance with suggestions that were received, and a pamphlet was prepared giving explanations of the items used in the blank for securing statistics of State school systems.

Thus far the State departments of education in 12 of the Eastern States have been visited and arrangements made for the collection by them of all the statistics needed by the bureau in accordance with the following plan:

1. The State department of education should be the only agency within a State to which the Federal Government should be required to apply for information regarding educational statistics.

2. Each State department of education should collect and include in its reports statistical and other information in regard to all educational institutions and activities, public and private, in the State, from kindergartens to universities and colleges, and including libraries, schools of music, art, etc., so that its reports may constitute a history of all educational activities in the State.

3. The statistics of each State should be collected and compiled in such form and manner that they may be easily and correctly comparable with those of all other States. To this end all States should collect information regarding at least all the items included in the

blanks formulated by the Bureau of Education and in accordance with the explanation of items issued by the bureau.

4. The State departments of education should collect for the Bureau of Education biennially all statistics of all classes of educational systems and institutions in their respective States, thus making unnecessary the preparation by local school officers in the States of numerous reports, and insuring uniformity in statistics furnished to the Federal and State offices.

5. The State departments of education should furnish to the Bureau of Education biennially for the even-numbered years copies of the statistical reports of—

(*a*) The State school system.

(*b*) Each city and town having a population of $2,500 or over.

(*c*) Each public high school.

(*d*) Each private secondary school.

(*e*) Each university, college, and professional school, public and private.

(*f*) Each normal school, public and private.

(*g*) Each commercial school.

(*h*) Each summer school.

(*i*) Each State industrial or reform school.

(*j*) Each school for the blind, deaf, and feeble-minded, public and private.

(*k*) All other schools of whatever kind.

6. In so far as may be desired, the Bureau of Education will furnish to the several State departments of education the blanks necessary for the collection of statistics.

If this plan is adopted and carried out by all the States, comparable statistics will be secured and local school officers in the States will be relieved of the annoyance of making numerous reports in different forms. Furthermore, by requiring reports from all educational institutions in the State the State department of education will come to be recognized, as it should be, as the head of the entire educational system in the State and not merely of the common school system.

During the year ending June 30, 1919, the Statistical Division has completed the following listed pieces of work:

1. A considerable part of the Educational Directory for 1918–19, comprising lists of State officers of education, county and city superintendents, the names, locations, and important officials of schools for the deaf, blind, and feeble-minded, and similar information on colleges, universities, normal schools, and summer schools.

2. Addressograph plates giving the names and addresses of 65,000 school buildings were prepared and proof-read.

3. Statistics from approximately 50,000 schools.

4. For the Commissioner's Biennial Report, chapters on summer schools and private commercial schools.

5. Summary and interpretation of compulsory attendance laws.

At the close of the year the division had in process of completion—

1. A statistical report for all city schools of the United States of cities with more than 5,000 population.

2. A report of the public high schools of the United States, nearly completed.

3. A report of the private high schools, edited and tabulated.

4. A report of all normal schools, edited, tabulated, and summarized for the interpretation of the data.

5. A report of the colleges, universities, and professional schools of the United States, edited and partially tabulated.

6. Reports on schools for the deaf, blind, and feeble-minded, for nurse training schools, and for industrial schools for delinquents, edited and tabulated and ready for interpretation.

CORRESPONDENCE.

The following report is for the year ending June 30, 1919:

Letters received	227,958
Library publications received	48,138
Statistical reports, questionnaires, etc	103,907
Documents distributed	1,505,448
Mimeographed letters sent out	1,396,518
Circulation of periodicals:	
National School Service (semimonthly to May 1, 1919)	583,000
School Life (semimonthly)	40,000
Americanization (monthly; average)	21,447
Monthly Record of Current Educational Publications	12,500

A glance at the following table will show the steadily increasing amount of first-class mail handled through the office—a proof of growing usefulness to the country at large:

Year.	Number letters received.	Year.	Number letters received.
1910	18,463	1916	120,078
1912	45,543	1917	137,805
1913	68,528	1918	162,479
1914	84,332	1919	227,958
1915	86,817		

LIBRARY.

During the year the library continued to acquire new educational publications as issued, and also added to its shelves considerable

material of earlier date. The two largest single collections received were sets of textbooks used in the elementary and secondary schools of the Argentine Republic and Brazil, respectively. These two collections are very comprehensive and probably unique in the United States. The receipt of new European books on education has been much reduced during the war, but the library has secured nearly all of importance which have been published in friendly nations. From central Europe no books or periodicals had been received since early in 1916, until toward the close of the present year. Then a few current books and periodicals came from these countries. The library staff has arranged and organized all the new educational publications received, so as to make them readily available for consultation and use. The new accessions in general educational literature have been classified and catalogued, and progress has been made in cataloguing some older sections of the library.

In addition to the usual extensive use of the library by the bureau staff, more than 600 visitors were registered during the year as having made use of it. A great many visitors did not register, and the number consulting the library was far in excess of that given.

The educational bibliographies compiled and circulated by the library were in their usual great demand. The division continued to produce these bibliographies in typewritten, multigraphed, and printed form. More than 100 new ones were prepared during the year, and a large number of the lists already on hand were thoroughly revised and brought up to date. In January, 1919, the library began the publication of a new series of library leaflets, of which six numbers have already been issued, as follows: Nos. 1–5, lists of references on the following topics: 1. Rural Life and Culture; 2. Educational Tests and Measurements; 3. Play and Playgrounds; 4. Economic Value of Education; 5. The Junior High School. Library leaflet No. 6 is entitled "Stories for Young Children," and was prepared by the International Kindergarten Union and the Library Division in cooperation. The library also prepared during the year the usual 10 issues of the Monthly Record of Current Educational Publications and compiled an index to the annual series of the record for 1918.

The library also revised for 1918–19 the sections of the Educational Directory usually assigned to it, and collected and compiled the information for 45 pages of that bulletin.

The chief of the division contributed a section on "Library activities" to the Annual Report of the Commissioner for 1918, and prepared a chapter on "Library activities" for the Biennial Survey of Education, 1916–1918. He attended the 1919 meeting of the National Education Association at Milwaukee as an official representative of the Bureau of Education, and read a paper on "Young

people's reading circles" before the library department of the association on that occasion.

The statistics of library operations for the past year are as follows: Volumes and pamphlets added by gift, by exchange, and by purchase, 1,779; by copyright transfer from the Library of Congress, 507; serial numbers accessioned, 6,089; periodical numbers, 8,842; volumes sent to bindery, 877. The number of volumes catalogued and classified was 2,995. To borrowers from outside the office 2,270 volumes were loaned, the greater part of these books being forwarded by mail to points outside of Washington. The library answered during the year 2,670 letters requesting information or publications.

EDITORIAL DIVISION.

The demands of the war upon the Government Printing Office, made directly and indirectly, caused a marked decrease in the publications of the Bureau of Education during 1918. In the latter half of the year the list contained only (1) a few bulletins ordered long before, (2) the regular numbers of the periodicals School Life, Americanization, and Monthly Record of Current Educational Periodicals, (3) necessary reports, including those of four surveys conducted by the bureau, (4) eight advance chapters from the Biennial Survey of Education, and (5) a number of "leaflets" and brief "circulars," of which nearly all were directly in relation to the war.

The pressure of war work upon the Government Printing Office did not cease immediately after the armistice, for great numbers of blank forms and the like were required for the demobilization of the Army; but in 1919 it has been possible for the bureau to have a number of documents printed far in excess of that printed for it in any other similar period of the bureau's history.

The documents issued during the year ended June 30, 1919, were as follows:

BULLETINS, 1918.

2. The Publications of the United States Government.
5. Work of the Bureau of Education for the Natives of Alaska.
6. The Curriculum of the Woman's College.
10. Public School Classes for Crippled Children.
15. Educational Survey of Elyria, Ohio.
16. Facilidades Ofrecidas a Los Estudiantes Extranjeros.
17. History of Public School Education in Arizona.
18. Americanization as a War Measure.
19. Vocational Guidance in Secondary Education.
20. Monthly Record of Current Educational Publications, June, 1918.
21. Instruction in Journalism in Institutions of Higher Education.
22. Monthly Record of Current Educational Publications, Index, February, 1917–January, 1918.

25. Industrial Education in Wilmington, Delaware.
26. The National Council of Primary Education.
27. Rural-Teacher Preparation in State Normal Schools.
28. The Public Schools of Columbia, South Carolina.
29. American Agricultural Colleges.
30. Resources and Standards of Colleges of Arts and Sciences.
31. The Educational System of South Dakota.
32. Teaching American Ideals Through Literature.
33. Monthly Record of Current Educational Publications, September, 1918.
34. Monthly Record of Current Educational Publications, October, 1918.
35. Cardinal Principles of Secondary Education.
36. Educational Directory, 1918–19.
37. Courses of Study for the Preparation of Teachers of Manual Arts.
38. Kindergarten Supervision in City Schools.
39. Monthly Record of Current Educational Publications, November, 1918.
40. Recent State Legislation for Physical Education.
41. Statistics of Agricultural and Mechanical Colleges, 1916–17.
42. Monthly Record of Current Educational Publications, December, 1918.
43. Instruction in Art in the United States. (Advance sheets from Biennial Survey, 1916–18.)
44. Agricultural Education. (Advance sheets.)
45. Educational Surveys. (Advance sheets.)
46. Medical Education. (Advance sheets.)
47. Secondary Education. (Advance sheets.)
48. Public Education in the Cities of the United States. (Advance sheets.)
49. Kindergarten Education. (Advance sheets.)
50. Home Economics. (Advance sheets.)
51. Statistics of State Universities and State Colleges.

BULLETINS, 1919.

1. Monthly Record of Current Educational Publications, January, 1918.
3. Home Education. (Advance sheets.)
4. A Manual of Educational Legislation.
5. Instruction in Music. (Advance sheets.)
6. A Half-Time Mill School.
7. Rural Education. (Advance sheets.)
8. Life of Henry Barnard.
9. Education in Great Britain and Ireland. (Advance sheets.)
10. Educational Work of the Churches in 1916–1918. (Advance sheets.)
11. Monthly Record of Current Educational Publications, February, 1919.
12. Education in the Territories and Dependencies. (Advance sheets.)
13. Review of Educational Legislation, 1917, and 1918. (Advance sheets.)
14. Monthly Record of Educational Publications, March, 1919.
16. The Kindergarten Curriculum.
17. Educational Conditions in Spain. (Advance sheets.)
18. Commercial Education. (Advance sheets.)
19. Engineering Education. (Advance sheets.)
21. Education in Germany. (Advance sheets.)
23. Monthly Record of Current Educational Publications, April, 1919.
24. Educational Work of the Boy Scouts. (Advance sheets.)
25. Vocational Education. (Advance sheets.)
26. The United States School Garden Army. (Advance sheets.)
27. Recent Progress in Negro Education. (Advance sheets.)

29. Schools of Scandinavia: Finland, and Holland. (Advance sheets.)
30. The American Spirit in Education.
32. Monthly Record of Educational Publications: Index, February, 1918–January, 1919.
33. Girl Scouts as an Educational Force. (Advance sheets.)
34. Monthly Record of Current Educational Publications, May, 1919.
36. Education in Italy. (Advance sheets.)
38. Education in Switzerland, 1916–1918.
41. An Educational Study of Alabama.
42. Monthly Record of Current Educational Publications, June, 1919.

TEACHERS' LEAFLETS.

No. 1. Opportunities for History Teachers.
No. 2. Education in Patriotism. (Reprint.)
No. 3. Government Policies Involving the Schools in War Time. (Reprint.)
No. 4. Outline of an Emergency Course of Instruction on the War.
No. 5. Certain Defects in American Education, and the Remedies for Them. (Also reprint.)

LIBRARY LEAFLETS—LIST OF REFERENCES.

No. 1. List of References on Rural Life and Culture.
No. 2. List of References on Educational Tests and Measurements.
No. 3. List of References on Play and Playgrounds.
No. 4. List of References on the Economic Value of Education.
No. 5. List of References on the Junior High School.

HEALTH EDUCATION SERIES.

No. 1. Wanted Teachers to Enlist for Child Health Service.
No. 2. Diet for the School Child.
No. 3. Summer Health and Play School.
No. 4. Methods of Teaching Health:
Cards—Right Height and Weight.
Poster—Health, Strength, Joy.

KINDERGARTEN CIRCULARS.

No. 3. The Kindergarten and Americanization.

SECONDARY SCHOOL CIRCULARS.

No. 3. Science Teaching in Secondary Schools in the War Emergency.
No. 4. Industrial Arts in Secondary Schools in the War Emergency.

HIGHER EDUCATION CIRCULARS.

No. 11. The Bureau of Education and the Educational Survey Movement.
No. 12. Opportunities at College for Returning Soldiers.
No. 13. The College Catalogue.
No. 14. Advanced Educational Work Within a Government Bureau.

INDUSTRIAL EDUCATION CIRCULARS.

No. 1. Lessons From the War and Their Application in the Training of Teachers.
No. 2. The Cooperative School.
No. 3. Industrial Art as a National Asset.
No. 4. The Army Trade Tests.

HOME ECONOMICS CIRCULARS.

No. 2. Current Problems in Home Economics. (Reprint.)
No. 3. Teaching in Small High Schools. (Reprint.)
No. 4. Principles and Policies in Home Economics Education. (Reprint.)
No. 5. Government Publications for Home Economics Teachers and Students.
No. 6. A Course in Food Economics for the Housekeeper.
No. 7. Effect of War Conditions on Clothing and Textile Courses.
No. 8. Brief Courses in Home Making for Normal Schools.

READING COURSES.

No. 1. The World's Great Literary Bibles. (Reprint.)
No. 2. Great Literature—Ancient, Medieval, and Modern. (Reprint.)
No. 6. Thirty Books of Great Fiction. (Reprint.)
Thirty Books of Great Fiction. (Sec. A.)
Thirty Books of Great Fiction. (Sec. B.)
No. 7. Thirty World Heroes. (Reprint.)
Thirty World Heroes. (Sec. B.)
Thirty World Heroes. (Sec. C.)
No. 9. Thirty American Heroes. (Reprint.)
No. 10. American History. (Reprint.)
American History. (Sec. A.)
American History. (Sec. B.)

COMMUNITY CENTER CIRCULARS.

No. 1. Constitution of Community Associations.
No. 2. Community Buildings as Soldiers' Memorials.

LESSONS IN COMMUNITY AND NATIONAL LIFE.

Series A, B, and C.

SCHOOL LIFE.

Index and title page, volume 1, August–December.
Volume 1: Nos. 1–10.
Volume 2: Nos. 1–12.
Volume 3: Nos. 1–2.

AMERICANIZATION.

No. 1. September 1, 1918.
No. 2. October 1, 1918.
No. 3. November 1, 1918.
No. 4. December 1, 1918.
No. 5. January 1, 1919.
No. 6. February 1, 1919.
No. 7. March 1, 1919.
No. 8. April 1, 1919.
No. 9. May 1, 1919.
No. 10. June 1, 1919.

MISCELLANEOUS PUBLICATIONS.

Rules and Regulations Regarding the United States Reindeer Service in Alaska. (Reprint.)
Europe's Educational Message to America.
Broadside—Three Genies of the Hand-Grenade.

UNFINISHED PRINTING.

The following documents were in the hands of the printer at the close of the year:

BULLETINS.

The National Council of Primary Education. (Reprint.)
Standardization of Medical Inspection Facilities.
The Adjustment of the Teaching Load in a University.
The Rural Teachers of Nebraska.
A Survey of Higher Education, 1916–1918. (Advance sheets.)
Educational Periodicals During the Nineteenth Century.
Summer Schools in 1919. (Advance sheets.)
The Junior College.
Educational Changes in Russia.
Training Little Children.
Work of the Bureau of Education for the Natives of Alaska.
Education in France. (Advance sheets.)
Modern Education in China.

LIBRARY LEAFLET.

Stories for Young Children.

KINDERGARTEN EDUCATION CIRCULAR.

Manufacturers Endorse the Kindergarten.

READING COURSE.

France and Her History.

Section II.

HIGHER EDUCATION.

SPECIAL WAR ACTIVITIES.

The normal procedure of the division of higher education was altered by the war. A large part of the time of all members of the division was devoted to various emergency services rendered necessary by the fact that the country was at war. In the following paragraphs the more important of these activities are listed:

The specialist in higher education has served as a member of the Advisory Board of the Committee on Education and Special Training of the War Department from the time of its organization, in February, 1918. Through the summer and autumn of 1918 this committee had charge of the training of mechanics and technicians for the Army in civilian institutions and of the Students' Army Training Corps, established in nearly all the colleges and universities of the country. In the formulation of the plans for all these activities and in the actual administration of them the division's representative was almost constantly occupied up to December, 1918.

The specialist in higher education served also as a member of the Committee on Educational Relations of the National Research Council, and as a member of the advisory committee of the educational bureau of the Young Men's Christian Association. Other members of the division were called upon from time to time to prepare data for the use of these and other emergency bodies.

PUBLICATIONS.

The publications of the division have dealt in large part with the war situation as it affected higher education. Thus the division has prepared a section on higher education for the Report of the Commissioner of Education, a biennial survey of higher education, 1916–1918, and has issued three circulars in the series entitled "The Work of American Colleges and Universities During the War." Of these the most important was doubtless Circular No. 12, entitled "Opportunities at College for Returning Soldiers," issued December, 1918, and presenting a summarized statement of the special concessions colleges were willing to make for the benefit of discharged soldiers, sailors, and marines. In addition, it issued to college officers a multigraphed circular entitled "Suggestions to Colleges Concerning the Admission of Returning Soldiers," in which it proposed the relaxation of formal entrance requirements and the substitution of army intelligence tests in the case of returning soldiers with defective secondary school preparation. The response of the colleges to these suggestions was summarized in another circular sent to demobilization camps. Other publications of the division have been Bulletin, 1918, No. 16, "Facilidades Ofrecidas a los Estudiantes Extranjeros en los Colegios y Universidades de los Estados Unidos"; Bulletin, 1918, No. 29, "American Agricultural Colleges"; Bulletin, 1918, No. 30, "Resources and Standards of Colleges of Arts and Sciences"; Bulletin, 1918, No. 51, "Statistics of State Universities and State Colleges"; a section on higher education in Bulletin, 1919, No. 41, entitled "An Educational Study of Alabama." The division has prepared for publication manuscripts of bulletins as follows: "Survey of Higher Educational Institutions of South Dakota," "Requirements for the Bachelor's Degree in the United States," "The Curricula of the Students' Army Training Corps," a report of the Committee on Agricultural Education of the National Education Association Commission on the Reorganization of the Secondary School Curricula. It has also prepared a circular on "Salaries of College Teachers."

OTHER ACTIVITIES.

All the members of the division were engaged during the spring of 1919 in work connected with the study of higher institutions in

Alabama. The specialist in higher education, the specialist in agricultural education, and the specialist in land-grant college statistics spent several weeks in field work in Alabama in connection with this survey. The report, which was presented to the Alabama educational commission by the specialist in higher education on June 9, contained 42 recommendations relating to the administration and support of the higher educational institutions of the State. In recommending an apportionment of the field of professional training between the University of Alabama and the Alabama Polytechnic Institute the report followed the now familiar policy of the bureau of dividing the work of these institutions into major and service lines. Perhaps the most important new recommendation was that providing for the creation of a State council of education, composed of representatives of the administration of the State school system and each of the higher institutions; the future determination by it of State needs in the field of professional training; and the allocation of the different portions of the tasks of professional training among the several higher institutions in harmony with the definition of the spheres of those institutions.

At the request of The Adjutant General of the Army, the division has passed upon the eligibility for accrediting by the United States Military Academy of 473 institutions.

The division has prepared for the biennial report of the Commissioner of Education statistics of higher institutions and special statistics of land-grant colleges.

The specialist in higher education represented the division at the following important educational gatherings, at all but two of which he delivered addresses:

The Section on Higher Education of the National Education Association, 1918.

The American Council on Education, 1918.

College Entrance Examination Board, 1918.

National Association of State Universities, 1918.

Association of Colleges and Preparatory Schools of the Middle States and Maryland, 1918.

Association of American Universities, 1918.

Society for the Promotion of Engineering Education, 1918.

National Conference Committee on Standards of Colleges and Secondary Schools, 1919.

The convention of the Association of Collegiate Alumnæ, 1919.

The inauguration of President McConaughy of Knox College, 1919.

The specialist in agricultural education has represented the division at meetings of the Association of American Agricultural Colleges and Experiment Stations, the National Society for Vocational Education, and conferences on commercial engineering, all in 1919.

The specialist in land-grant college statistics represented the division at the meeting of the Association of American Agricultural Colleges and Experiment Stations and the Department of Superintendence of the National Association, both in 1919.

The division organized a series of conferences of specialists in agricultural education for the preparation of courses of study in agriculture. It participated in conferences of the War Department with representatives of colleges and universities in regard to the promotion of military training in higher institutions. It took part in conferences of the Young Men's Christian Association Overseas Educational Commission, and it conducted conferences for Reserve Officers Training Corps commanders at Camp Lee.

The division was intimately connected with the entertainment of the British Educational Mission in the autumn of 1918. The specialist in higher education served on the entertainment committee of the American Council on Education, had charge of the arrangements for the entertainment of the mission in Washington, and assisted in organizing the itinerary of the mission through the United States. For the benefit of the mission the division prepared a report on fellowships and scholarships available for British students in American universities.

RURAL SCHOOLS.

In addition to the large amount of routine work of correspondence, keeping in touch with the progress of rural education throughout the country, noting important legislation affecting rural schools, studying noteworthy departures in rural school practice, including changes in courses of study and methods in organization and teaching, giving information and advice to school officers and teachers in response to thousands of inquiries by letter and personal visitation, attending and addressing teachers' institutes, and local, State, and national meetings of associations of teachers, school officers, and citizens interested in rural schools and the means of their improvement, the Division of Rural Schools and its members accomplished the following pieces of work:

The division completed for publication the portions of the report of the educational survey of the State of South Dakota pertaining to the general school system and the rural schools and normal schools. This survey was made under the direction of the chief of this division in the winter and spring of 1918 at the request of the State survey commission created by act of the legislature.

At the request of the board of trustees of the schools supported by the superintendent of schools of La Crosse County and the State superintendent of schools of Wisconsin a study was made of the work of the county agricultural school of La Crosse County, Wis.,

and of its place in the county system of schools and a report with recommendations submitted.

Studies of rural education in Nebraska were completed and a report prepared for publication as a bulletin of the Bureau of Education. These studies were made in cooperation with the School of Education of the University of Nebraska.

A survey of rural schools of Walker County, Tex., and a report with recommendations was prepared for publication as a bulletin of the bureau.

A report of the survey of the rural schools of Falls County, Tex., made in the fiscal year ended June 30, 1918, was completed for publication as a bulletin of the bureau.

At the request of the survey committee of the State of Alabama, created by act of the legislature of the State during the first half of its quadrennial session, the Bureau of Education undertook a comprehensive survey of the State system of education and of all its parts, including the higher institutions of learning, schools for the blind and deaf and other exceptional children. The whole of the survey was made under the direction of the chief of the rural-school division of the bureau, and other members of this division assisted in the survey of the rural schools, including the county high schools, normal schools, and district agricultural schools. The report of the survey was prepared and published as a bulletin of the bureau, and a great majority of its recommendations were embodied in a new and comprehensive School Code during the second half of the session of the legislature. The entire report, with all its recommendations, received the hearty approval of the State survey commission, and it is believed that further recommendations not embodied in the School Code will be adopted as soon as necessary amendments to the constitution of the State can be had and when further developments of the system makes their adoption advisable.

In making surveys of this kind it is not the policy of this bureau to make such recommendations only as can be put into operation at once, but rather to make such a list of constructive recommendations as may serve as a chart for the improvement of the schools and the school system for 5 or 10 or more years.

A detailed study of the possibilities of consolidating the seven one-room, one-teacher schools of Mount Joy Township, Adams County, Pa., into one school, and of the advantages that might be expected to accrue from such consolidation, was made at the request of the superintendent of schools of Adams County and the State department of education. The results of this study will be published as a bulletin of the Bureau of Education. One of the special reasons for this survey at this time was the desire of the people of this town-

ship to use the consolidated school as a community center, both for the ordinary purposes of such a center and also for cooperative buying and selling and exchange of products with community organizations in the city of Washington. The Post Office Department assisted in establishing the cooperative exchange.

A thorough and comprehensive study of rural-school consolidation in the country at large and in typical counties in which consolidation has made most progress has been made. This study includes readjustments in courses of study and improvement in methods and results made possible by consolidation. It is the most comprehensive study of the kind yet made. The results of the study are being prepared and are now almost ready for publication in three separate bulletins of the Bureau of Education.

Last fall a nation-wide inquiry was made to ascertain the extent of the shortage of teachers. Results of the inquiry showed a shortage of rural teachers in almost every section of every State. It is estimated there was a total shortage of approximately 50,000 and an unusual number of young, inexperienced teachers and a consequent lowering of standards. As a result of this inquiry the Commissioner of Education, assisted by the Division of Rural Schools, entered upon a campaign for recruiting all rural teachers from the ranks of married women and others who had previously had successful experience as teachers and whose circumstances were such as to permit them to reenter the schools, temporarily at least, for this important patriotic service. Foreseeing the continuance of this shortage of teachers, normal schools and colleges and universities having departments of education connected with them were urged to offer special short courses for these persons and otherwise to increase their efforts for the preparation of teachers, and young men and women having suitable preparation were urged to enter these schools and prepare themselves for teaching. As a further result of the findings of this inquiry, the President allotted to the Secretary of the Interior $25,000 out of the appropriation for the national security and defense to establish and maintain through the remainder of the fiscal year the School Board Service Division of the bureau. This is referred to elsewhere in this statement.

Since the beginning of the rapid increase in prices and the cost of living, this bureau has been urging boards of education, legislatures, city councils, and other legislative bodies to increase salaries of teachers and to make the necessary provisions therefor through increased appropriations and tax levies, to the end not only that the pay of teachers might keep pace with the rise in prices and in pay for other forms of service as was necessary to prevent lowering of standards in the qualifications of teachers and the work of the schools through the loss of the more competent teachers to other em-

ployment, but also that if possible these standards might be raised to meet the new and urgent demands made upon the schools. Reports made to this bureau for the year ended June 30, 1918, show an average increase of about 17 per cent in the total expenditures for the pay of teachers' salaries for the annual period 1917 and 1918, but the separate inquiry made to the rural-school division as to the salaries of rural-school teachers indicated that the increase in pay of these teachers has not been so large as that of the average, which has been raised chiefly by the increase in the pay of city school teachers. On the basis of the revelations of this inquiry, State legislatures and county, township, and district tax-levying bodies, on whose action any increase in funds available for paying teachers in rural schools must depend, have been urged to make relatively large increases in appropriations and tax levies for this purpose. Plainly, little or nothing is to be gained by increasing the monthly rate of the pay of teachers at the expense of shortening the school term. It is the total amount of pay for the school year rather than the wages per month that counts.

In view of the fact that the legislatures of more than four-fifths of the States were to meet in the calendar year 1919, this division of the bureau prepared for the use of the State departments of education and members of such legislatures a legislative manual in which were summarized in forms easily read and understood all of the most important educational statistics, showing in a comparative way the conditions and needs of the rural schools in the United States. This manual was published as Bulletin of the Bureau of Education, 1919, No. 4, and was distributed to the persons for whose use it was designed.

A comprehensive study on the certification of teachers in the several States is now almost finished and will soon be published as a bulletin of the bureau.

An investigation has been in progress in regard to the standardization of rural schools in the several States. The purpose of the investigation is to bring together in compact form the standards which have been adopted for school buildings, school equipment, school sanitation, course of study, etc. The results of the investigation will be published as a bulletin of the bureau.

A comprehensive study of free public libraries as they affect the rural population of the country of the need of county libraries and of the ability of counties to maintain them has been completed and will be published as a bulletin of the Bureau of Education. This study shows that 2,200 counties, or about two-thirds of all of the counties of the United States, have no public libraries or none containing as many as 5,000 volumes, that more than half the people of the United States have no access to any adequate collection of books,

and that practically all of these counties might at a cost that would not involve excessive taxation maintain good libraries at the county seats or elsewhere, with branch libraries in the most important towns and villages, making use of the schools as distributing centers. In this way the general educational facilities of these counties might be increased in large proportion. The study also shows how through cooperation of cities and counties the city libraries might easily be made available for the free use of the rural population of the counties in which they are located.

Believing the schools in the villages and small towns to be capable of assuming a much more important place among the educational agencies of the country than they now have and conscious of the comparative neglect of these schools in all these studies of education and in all plans for school improvement, much attention has been given to this subject. In the last year and a half two interesting and valuable national conferences on village schools have been held, one in connection with the meeting of the National Education Association at Pittsburgh in July, 1918, and one in connection with the meeting of the Department of Superintendence of the National Education Association at Chicago, in February, 1919. Two conferences on the special needs of schools in mining villages and small mining towns have been held, and one member of this division has devoted several weeks to a first-hand study of conditions in mining villages in Pennsylvania and West Virginia coal fields. Another member of this division and the specialist in educational systems attached to the Division of City School Administration have given special attention to the condition and needs of southern cotton mill villages with a view to making recommendations for the improvement of their schools.

A bulletin, soon to be published, has been prepared showing the present practice in village and small-town school organization and showing the opportunities for their improvement and particularly for their use as consolidation centers. The studies already made indicate that this is a very useful field and this work will be continued and enlarged. There are in the United States more than 10,000 villages and towns having a population under 2,500 and a total population of more than 8,000,000.

With the assistance of other members of this division the school-extension agent has held three important national and sectional conferences on rural education—one at Stevens Point, Wis., December 22–25, 1918; one at Daytona, Fla., February 1–4, 1919; and one at Oklahoma City, April 30–May 3, 1919. Plans were made for a conference at Sioux Falls, S. Dak., in the early spring, but the conference was postponed on account of the epidemic of influenza in the North Central States at that time and will be held in October. These

conferences were largely attended by educators, governors of States, and other public officials, and laymen interested in the cause of rural education. The Oklahoma City conference was the twelfth of these conferences on rural education held by the Bureau of Education, the first having been held in Chicago in 1914. They have proven very valuable in stimulating intelligent interest in rural school improvement and in getting before the people for consideration and discussion the program of this bureau for rural school improvement. This program, now generally accepted as a working basis, includes the following 12 recommendations:

1. An academic term of not less than 160 days in every rural community.

2. A sufficient number of teachers adequately prepared for their work.

3. Consolidation of rural schools where practicable.

4. Teachers' home and demonstration farm of 5 or more acres as a part of the school property.

5. An all-year school session adapted to local conditions.

6. A county library with branch libraries at the centers of population, the public schools to be used as distributing centers.

7. Community organization with the school as the intellectual, industrial, and social center.

8. A high-school education for all country boys and girls without severing home ties in obtaining that education.

9. Such readjustment and reformation of the course of study in elementary and secondary rural schools as will adapt them to the needs of rural life.

10. Federal cooperation in public education.

11. The elimination of illiteracy.

12. Americanization of all citizens through a better civic and patriotic instruction.

The Rural School Extension agent and other members of the division cooperated with the State superintendent of schools of Texas in planning and holding a rural school conference in that State in June, 1919, in connection with summer schools at four normal schools, the State university, and the State college of agriculture.

The work of the Rural Teachers' Reading Circle has been continued under the direction of this division. The number of readers is increasing. Its purpose is to stimulate the best and most progressive rural teachers, superintendents, and supervisors of schools to read systematically a good number of the stimulating and instructive books on the fundamental purposes and practices of education, on rural economics and rural life, and on the organization and conduct of rural schools.

The educational section of the Department of the Interior Exposition in the spring of 1919 was prepared under the direction of this division of the bureau. Among other items of this display were a modern rural school, a modern home garden, and charts showing the work of the various divisions of the bureau, and displays from the Americanization Division and the Educational Extension Division of the bureau, including the Visual Instruction Division.

In common with other members of the bureau, the members of this division participated in many forms of patriotic work; in raising Liberty loans, in Red Cross drives, and in promoting patriotic work in the public schools. The Educational Extension agent assisted in the presentation of "The Continental Congress" at the consolidated rural school at Whitmell, Va., at Knoxville, Tenn., at the meeting of the Southern Sociological Congress, and at the University of Virginia on July 4.

One member of this division was detailed for half of the year to the United States School Garden Army. Another was on leave without pay, and was working with the office of the Surgeon General of the United States Army.

CITY SCHOOL ADMINISTRATION.

In addition to the routine work of correspondence, holding conferences, and giving information and advice to school officers and teachers, the Division of City School Administration, to which are attached the kindergarten specialists, assistants, and collaborators, reports as follows:

This division completed the report of the survey of the schools of Columbia, S. C., made in the preceding year, and prepared it for publication. The chief of the division directed that part of the survey of the educational system of the State of Alabama relating to the organization, support, equipment, and work of the schools system of the 46 cities of the State, and prepared the report of this part of the survey.

The chief of the division had immediate direction of the survey of the schools of the city of Memphis, Tenn., made by this bureau last spring. Two other members of the division assisted in the survey, and the division put the several parts of the report into final shape for printing.

The division has conducted a study of the relation of education to industrial and social conditions in the city of Passaic, N. J. This study will be continued and completed within the current year.

The specialist in school systems, attached to this division, has begun a study of the schools at Erlanger, a typical cotton-mill village near Lexington, N. C., and will, under the direction of the commissioner, assist in reorganizing these schools and in readjusting their courses of

study so as to adapt them to the conditions and needs of the people. As an introduction to the study of local economics and as a coordinating subject in these schools, there has been collected and prepared an extensive course on the cultivation, manufacture, and uses of cotton. The schools of this mill town have been taken as typical of the schools of cotton-mill towns in the South.

The specialist in school systems has also prepared a bulletin on the phonic method of teaching reading.

The division outlined for the superintendent and board of education of Elizabeth City, N. C., a plan for the survey of the schools of that city.

A study has been made of the causes of failure and nonpromotion in the primary grades of the public schools.

Among the more important conferences held was a conference of superintendents of schools in cities having large industrial interests, for the purpose of discussing plans whereby school terms and hours of attendance might be adjusted to the needs of older boys and girls who, under pressure of war needs, were seeking employment in industrial plants.

Kindergartens.—Three studies relating to the kindergarten have been completed and published as bulletins of the bureau: Kindergarten Supervision in City Schools; A Survey of Kindergarten Education for the Years 1916 to 1918; and The Kindergarten Curriculum. Studies now in progress, the results of which will be published by the bureau, are: Salaries and hours of work of kindergarten teachers as compared with those of the first grade; modifications in kindergarten equipment; and training courses in colleges for women. In cooperation with the International Kindergarten Union, work is in progress on a curriculum for the first grade, based on the work of the kindergarten. An illustrated bulletin is in preparation for publication, showing the more important activities of children in the kindergartens.

Many thousands of circular letters have been sent to kindergarten teachers, and more than 60,000 leaflets on the kindergarten have been sent to legislators and other persons whom it was desired to interest in kindergarten legislation and other means of promoting the kindergarten. Special assistance has been given to the workers for kindergartens in several States in planning and promoting legislative programs. An intensive campaign for the establishment of kindergartens was conducted in the State of Texas.

A reading course for graduate kindergartners has resulted in an enrollment of readers from every part of the country. A leaflet emphasizing practical ways in which the kindergarten can further the work of Americanization has had wide distribution among school superintendents and kindergarten teachers in cities and towns having

large foreign-born populations and has been helpful in getting kindergartens established for the children of foreigners.

The Chief of the Division of City School Administration cooperated with the French High Commission in placing French teachers in the schools of the United States. The kindergarten specialist assisted the Ordnance Bureau of the War Department in connection with the equipment of kindergartens in the Government schools at munition plants. All members of the division participated in the war work in many ways.

SCHOOL ADMINISTRATION.

The specialist in school administration has brought up to date the bulletin on laws pertaining to the adoption and supply of textbooks; prepared a brief summary of the history of education in the State of Alabama, which was published as a chapter in the Educational Survey of Alabama; prepared a summary review of educational legislation in the several States in 1917 and 1918, which was published as Bulletin, 1919, No. 13; begun a similar review of educational legislation for the years 1918 and 1919; made a study of the educational activities of governmental departments in Washington; and has continued the study already begun on the source of school revenues in the several States. While the legislatures were in session he distributed to State departments of education and legislative committees copies of 24 legislative circulars summarizing pending and completed educational legislation in the several States.

EDUCATION IN INDUSTRIES AND HOME MAKING.

Conferences were organized and held in Washington by the bureau for the purpose of considering and making recommendations regarding: (1) Part-time schools in cities as a means of reaching boys and girls who left school to work; (2) special provision of evening classes for Government employees in the District of Columbia; (3) effect of the war on high-school enrollment; (4) promotion of cooperation between the public schools, chambers of commerce, and labor unions; (5) preparation of bulletins on conservation of food for use by teachers of home economics.

Conferences of specialists called by the Commissioner of Education were conducted as follows: (1) Specialists engaged in training teachers of manual training and industrial education in institutions in the Mississippi Valley, held at the State Normal School, Terre Haute, Ind.; (2) specialists in industrial education, held at the Statler Hotel, St. Louis, Mo.; (3) directors of vocational units, Students' Army Training Corps, held at the office of the board of education, Chicago, Ill.

The specialist in industrial education has rendered assistance to the committee on education and special training of the War Department in preparing a series of outlines of courses of instruction in mechanical trades for the use of institutions engaged in training soldiers.

He has been detailed to field work for an aggregate of 44 days, holding conferences of specialists in industrial education, assisting in the survey of the schools of Memphis, Tenn., representing the bureau at educational conventions, and similar duties. Since March 10 he has been detailed to special duties as assistant to the commissioner.

The specialists in home economics have assisted in the surveys of the public schools of Memphis, Tenn., and the State systems of public schools of Tennessee and Alabama, lectured on home economics in teachers' institutes and summer schools, held conferences of specialists in home economics, and represented the bureau at educational conventions.

They also rendered assistance to the Food Administration and to the Department of Agriculture in formulating material for publication in bulletins on home economics. One specialist assisted in the nursing and food service at the Emergency Hospital in Washington during the influenza epidemic in November. Special studies have been begun of the reorganization of home economics instruction in secondary schools and of State and Federal legislation relating to home economics in the schools.

This division prepared the chapters on "Vocational education" and "Home economics" for the biennial survey of the Bureau of Education, and a revised "Bibliography of Home Economics Instruction," also the manuscripts for the following publications:

Industrial Education Circular No. 1, "Lessons from the War and their Application in the Training of Teachers."

Industrial Education Circular No. 2, "The Cooperative School."

Industrial Education Circular No. 4, "The Army Trade Tests."

Home Economics Circular No. 7, "Effect of War Conditions on Clothing and Textile Courses."

Home Economics Circular No. 8, "Brief Courses in Homemaking for Normal Schools."

One specialist in home economics has been absent from the Bureau of Education since March 20 on account of illness, and another resigned June 15 to accept a position at Hampton Institute, Hampton, Va.

AGRICULTURAL EDUCATION.

The major part of the time of the specialist in agricultural education is required in connection with projects relating to the work

of the agricultural colleges, mention of which has been made in the report of the Division of Higher Education. The remainder of this time is spent upon studies relating to agriculture in the secondary and elementary schools.

During the year covered by this report the chief project undertaken, affecting secondary and elementary agriculture, was a study of the agricultural curriculum. With a view to obtaining information concerning present practices, the course of study outlines followed by the several States were obtained and studied. Information concerning articulation between secondary schools and colleges also was obtained. The result of this inquiry revealed the fact that there is a conspicuous lack of uniformity in the scope and method of instruction and a noteworthy absence of articulation between the high-school and college courses in agriculture. So diverse were the practices that it seemed desirable to call together for conference a small group of agricultural education specialists throughout the country. Such a conference was held on January 31 and February 1, 1919. At this meeting subcommittees were appointed to consider certain phases of the subject. These committees on March 7 and 8 made a report of progress, in which they outlined the needs in each field. There remains the work of preparing outlines for each phase of the agricultural field.

The specialist in agricultural education made a study of the facilities for the training of teachers of agriculture for the secondary schools. The report on this study has been presented for publication.

COMMERCIAL EDUCATION.

Because of the great interest now manifested in commercial education, especially for our large prospective foreign commerce and in education for foreign service in industrial enterprises and otherwise, the pressure on the Division of Commercial Education with its one specialist has been very great. There is immediate need for a large addition to the personnel of this division.

In addition to special surveys and investigations, preparation of bulletins, reports, circulars, etc., and occasional lectures and addresses in the general field of educational preparation for foreign and domestic business, it is the duty of the specialist in commercial education to answer all inquiries pertaining to commercial education received by the bureau.

During the fiscal year 1918–19 the bureau carried on through this division the following surveys, the complete results of which will be published as bulletins of this bureau.

1. A survey of 15 major cities in cooperation with the Bureau of Foreign and Domestic Commerce, Committee of Fifteen on Educa-

tional Preparation for Foreign Service, American Association of Urban Universities, and local committees with representation from trade, industries, and education.

2. A survey of all cities with 25,000 inhabitants and over, some 250 in all, carried on direct from the bureau in cooperation with local committees, of which the city superintendent of schools acted as chairman.

The purpose of these two surveys is to ascertain the extent and character of the foreign business of these cities, the number of people employed and the kind of service rendered by them, and whether and how the schools and colleges can train men and women for foreign business.

3. In cooperation with the educational director of that association surveys of the work carried on by the educational departments of the Young Men's Christian Association.

4. A survey of all commercial teacher training work carried on in colleges, universities, and normal schools.

5. A survey of colleges and universities to ascertain what facilities they offer in preparation of students in engineering or business for management positions in industry and commerce, and for overseas engineering development projects and commercial enterprises.

The results of this last investigation served as a basis for the constructive work of the commercial engineering conferences of February 22, March 31, and April 1, and June 23 and 24, which were held in St. Louis and Washington under the direction of the specialist in commercial education. The genesis and development of this project, including the proceedings in full of the public conference of June 23 and 24, have been prepared for publication as a bulletin of this bureau.

In addition to these surveys the specialist in commercial education has prepared and will shortly submit for publication a bulletin on "Training for Foreign Service," and, in cooperation with a committee from the Association of Accredited Schools, a "Course of Study for Use in Private Business Schools." Under his direction there is being prepared a brief but definite statement in respect to training for business in the 21 countries constituting the Pan American Union. This work is being done in cooperation with a well-known scholar in each of these countries.

During the past year frequent trips, including one to the Pacific coast, were made by the specialist in commercial education for the purpose of personally directing the surveys now being carried on in certain cities and of addressing educational institutions, business organizations, and civic clubs on the general subject of "Training for business."

CIVIC EDUCATION.

A remarkable stimulation of interest in civic education resulted from the war, and it is perhaps worthy of note that the bulletins relating to civic education published by the Bureau of Education prior to this year, and other publications prepared by the bureau's specialist in civic education, have been widely influential in determining the character of instruction introduced into the public schools for purposes of civic training.

The demand for these and other materials and for assistance in developing courses of civic training has greatly increased, not only from public schools, but also from other agencies interested in extending civic education to various groups of the people.

The pressure of war activities diverted the specialist in civic education during the past year from the logical development of work begun prior to the war and interfered with the preparation and publication of materials for which there is a great demand now that the was is over. Much of his time was devoted to the preparation of materials bearing directly upon the war and upon governmental activities relating to the war, these materials being of more or less transient usefulness. Nevertheless, material has been assembled which it is believed will be serviceable in the extension of civic training both in the schools and among citizens generally.

The specialist in civic education cooperated with the overseas educational commission of the Young Men's Christian Association and prepared a pamphlet of about 100 pages, entitled "Team Work Through Government," constituting an elementary course in citizenship for our soldiers overseas. Of this 25,000 copies were taken.

The specialist in civic education participated in the survey of the schools of Memphis, Tenn., and prepared a report on the conditions and need of civic education in that city. This will be published as a part of the report of this survey.

HOME EDUCATION.

The working force of the Home Education Division has this year consisted of a secretary, a stenographer, and a clerk, with the addition of another clerk during the months of May and June.

During the year two new reading courses, No. 7, "Thirty World Heroes," and No. 9, "Thirty American Heroes," were published, and a series of "After the War Reading Courses" and reading courses on such vocational subjects as shipbuilding, machine-shop work, iron and steel, seamanship, and agriculture have been begun.

Of the standard reading courses nearly 230,000 copies have been distributed through high schools, libraries, and other agencies, and 160,000 copies of six "After War Reading Courses for Soldiers" were

distributed to camps and cantonments in the United States and overseas. Thirty thousand form letters have been sent out and more than 6,000 bulletins on the care and education of young children. The addressograph list of parent-teacher associations, containing names of all organizations doing work similar to parent-teacher associations, such as home and school associations, school improvement associations, etc., has been increased.

More than 10,000 readers are enrolled in the National Reading Circle. These are mostly in rural communities and villages and small towns, but are not confined to these. Among the most successful of these reading circles is one of 150 members in Glendale, Calif. In Cleveland and Pittsburgh there are reading circles having a membership of more than 150, and in the District of Columbia there is a circle of 90.

The purpose of the work of this division is fourfold:

1. To help parents in the care and training of their little children before the children become of school age. To this end the division has prepared a specially designed reading course for parents to give them knowledge of the duties of parenthood. It has also sent out Public Health bulletins on the diet and the care of babies and similar publications.

2. To help parents further their own education. For this purpose the division has continued to issue a series of 10 reading courses designed largely for general information and cultural development. The division requires written summaries of the books and answers to test questions given for the purpose of determining how carefully the books have been read and how well they have been understood. When a course has been properly completed, a certificate signed by the Commissioner of Education is issued to the reader.

3. To promote the education of boys and girls who have left school and of older persons. Two courses have been especially designed, a miscellaneous course for girls and a like course for boys, to be read by young people who have left school at an early age but are still at home.

4. To promote a closer cooperation of home and school by the organization of parent-teacher associations. At the inception of this division the names were obtained of 60,000 women living near to country and village schools who would be willing to assist in bringing about a closer relation between home and school. These women have distributed material regarding the organization of parent-teacher associations, have assisted in placing information on the care of babies in the hands of mothers of young children, and have helped in maintaining the interest of parents in the schools.

During the war the division extended its work to include several reading courses for soldiers in the camps. Since demobilization these courses have been continued for discharged soldiers in their homes.

The cooperation of the National Congress of Mothers and Parent-Teacher Association, through which this division had been maintained since 1913, became illegal on July 1, and the greater part of the work has had to be suspended. It will be taken up and continued as a part of the work of educational extension if Congress make an appropriation for this extension work. An effort will then be made to organize the work definitely in all of the States in cooperation with State departments of education, universities, and normal schools. In this way it can be made much more valuable than it has been. The response of the people to the opportunities offered by the bureau through this division of its work has been such as to demonstrate its very great possibilities of usefulness, and it is sincerely hoped that it can be continued.

RACIAL GROUPS.

During the year the work of the division has centered around activities connected with the war and the educational problems growing out of the war. The migration of Negroes from the South to northern industrial centers has produced an aroused interest in the needs of the Negro and his training for citizenship and for the economic responsibilities which are more and more coming to him. This interest has been shown by increased appropriations in many sections of the South for the education of Negro children, by conferences which have been called to consider these matters, and by an increased correspondence with the bureau concerning ways and means of meeting the enlarged demands.

During the war three men from this division were loaned for war activities. One man became an educational adviser to the Young Men's Christian Association in France in its dealings with the Negro soldier. Another was a supervisor under the Committee on Education and Special Training of the War Department. A third was used in the personnel section of the War Department to assist in the placing of Negro soldiers in the service of supplies.

The field work of the division has consisted in the study of Negro schools for the Alabama Survey and in making investigations in a number of schools in South Carolina, Georgia, and Florida. These investigations are recorded and are of use in answering the many and varied inquiries addressed to the Bureau of Education by organizations and individuals interested in the education and development of the Negro population of the country.

On July 1 the cooperation of the Phelps-Stokes Fund, by which the work of the Bureau of Education had been maintained since February, 1912, became illegal, and as Congress had made no appropriation for its maintenance the division was discontinued at a time when the need for it had been greatly increased by the spirit of racial unrest following upon the war.

SCHOOL HYGIENE AND PHYSICAL EDUCATION.

ANNUAL STATEMENT 1918–19.

During the year 1918–19 the Division of School Hygiene and Physical Education has had the full-time services of one specialist in hygiene and physical education and one assistant, the part-time services of one special agent in schoolhouse construction and sanitation, the services for six months of a field agent for school health organization in cooperation with the Public Health Service, valuable expert and clerical assistance through the cooperation of the Child Health Organization of New York, and the cooperative services of several special collaborators.

The work of the division has included correspondence, office and research work, publications, attendance upon meetings of associations, addresses, conferences, surveys and investigations, special studies, and cooperation with other Government and voluntary organizations.

The correspondence of the division has been large and varied, covering all phases of school hygiene and physical education. The correspondence relative to schoolhouse construction and sanitation has been taken care of by the special agent in school sanitation, with offices at George Peabody College for Teachers, Nashville, Tenn. It has included help to school boards in planning school buildings, selection of sites, and criticisms of proposed plans submitted by architects.

The general office work has included preparation of memoranda for the commissioner: the examination and report upon manuscripts on school sanitation, health instruction, and physical education submitted for publication, about 25 in number; revision of manuscripts for publication, assistance to other divisions relative to hygiene and physical education, the preparation of special bibliographies, preparing and furnishing special information to responsible inquiries, indexing and filing correspondence, indexing and keeping the card catalogue up to date on the references in current literature for the various phases of school hygiene and physical education.

The specialist in school hygiene and physical education has attended and addressed a large number of meetings, including the National Education Association, American Public Health Association, National Child Labor Committee, Southern Sociological Congress, American Physical Education Association, the Missouri State Health Conference, and others. He has organized and held conferences in connection with meetings of the Department of Superintendence of the National Education Association and the American Physical Education Association.

The division, through the specialist and special agents, has taken part in the bureau's surveys of the school system in the State of Alabama and the city of Memphis. Their work has covered sites and buildings, health supervision, health instruction, and physical training activities. In addition, special field studies have been made in the organization of physical education and health work in the schools. School authorities have been conferred with and advised with respect to these matters. The special agent in schoolhouse construction has given personal aid to school boards in the following cities with respect to their building plans:

Five trips to Montgomery, Ala., to assist the county board of education in their extension building plan; Tuskaloosa, Ala., to advise the city board of education relative to a new high-school building; Bristol, R. I., for the same purpose; Helena, Ark., to make a survey of the school buildings, and Reno, Nev., to plan an educational building for the State university.

The specialist in school hygiene and physical education has prepared for the Biennial Survey a summary of important developments in education in hygiene during the biennium of 1916–1918; in cooperation with Dr. T. A. Storey, Bulletin No. 40, 1919, "Recent State Legislation for Physical Education," an analytical summary of the legislation in question and statement of principles giving such legislation; a preliminary report on "The Closure of Schools as a Means of Controlling Communicable Diseases" (in cooperation with the committee of the American Public Health Association).

The study of physical education in normal schools begun last year has been continued with an attempt to get reports from all normal schools on this phase of work. This is not intended for publication at this time.

In collaboration with Superintendent Grover C. Thames, of Magnolia, Miss., a study has been made by questionnaire of physical education in the State of Mississippi. This work is incomplete.

A complete study of the organization and conduct of school-health supervision has been outlined and begun. A preliminary tabulation and analytical study of the State laws has been completed. A questionnaire has been outlined for all cities of 2,500 and will be sent out in the fall. It is proposed to extend this inquiry to rural and village communities. The object is to get, at the end of the five-year period, as complete a picture as possible of the character and extent of school-health supervision throughout the country.

A study of janitor service in city schools has been begun in cooperation with the Division of City Schools.

Efforts have been made to cooperate with other governmental and voluntary agencies which have to do with school hygiene and physical education, with the ultimate object of coordinating as far as pos-

sible the forces and influences that touch the schools. Some effective cooperation has been carried on with the Public Health Service, Interdepartmental Social Hygiene Board, Boys' Working Reserve, Junior Red Cross, the American Physical Education Association, the Child Health Organization, National Antituberculosis Association, and others. The following special pieces of cooperation have been most noteworthy:

In cooperation with the Child Health Organization, the bureau has undertaken to direct the widespread interest in health incident to the war toward simple and practical methods of health teaching in the schools. To this end a Health Education Series, consisting of Classroom Weight Record and four pamphlets, has been published. The cooperation of 30 State superintendents and hundreds of city and county superintendents has resulted in a widespread use of this material. A number of large cities have adopted the plan as part of the irregular curriculum. Among these are Chicago, Kansas City, Mo., and Portland, Oreg. The program has aroused enthusiastic interest of many organizations, including the National Antituberculosis Association, the Federation of Woman's Clubs, the woman's committee of the Council of Defense, State health boards, the home-demonstration agents of the Department of Agriculture, and others. Very important service has been rendered by such organizations in bringing this method of health education to the attention of communities, which, in turn, have made it possible for the school authorities to put the plan into effective use in the schools. The interest in the work is constantly growing, as is indicated by the rapidly increasing numbers of inquiries and requests for material and assistance.

At the request of the Public Health Service the specialist in school hygiene was detailed to advise with the officers of the Division of Venereal Diseases of the Public Health Service relative to "plans for sex education and measures for securing the necessary cooperation of the educational systems of the country." The specialist in school hygiene has held many informal and a limited number of formal conferences with representatives of the Public Health Service for the purpose of making effective the terms of the detail. Under this arrangement conferences on sex education in the high school have been held in 12 cities: Philadelphia, Newark, New York, New Haven, Washington, Raleigh, Nashville, Cincinnati, Pittsburgh, Indianapolis, Detroit, and Rochester. Two of these the specialist attended personally. The object was to bring together, for exchange of views and experiences, teachers and others who might have something to contribute. As a result there has been brought to light a good deal of intelligent sex-education work in connection with home economics,

physical education, civics, and literature. The keynote has been the development of positive ideals of physical strength and vigor and social uprightness.

A series of pamphlets for high-school teachers has been planned, largely influenced by conference experiences.

As reported last year, a National Committee on Physical Education, consisting of representatives of national organizations, was formed for the purpose of encouraging legislation for physical education. The specialist in school hygiene and physical education served for some months as temporary secretary of this committee. At the request of the committee the Playground and Recreation Association of America established a new branch under the title of "The National Physical Education Service," with the specific object of furthering legislation for physical education. The specialist in school hygiene continues to act in advisory capacity to this organization.

THE UNITED STATES SCHOOL GARDEN ARMY.

Five years ago this bureau, through special act of Congress, began the promotion of school-directed home gardening. This work was confined to cities and towns, as earlier investigation had shown that the children of urban communities did not have educative or productive employment during the out-of-school hours and vacation periods. Although the original appropriation was small, the work proved satisfactory from the standpoint both of production and of education. When, under war conditions, the necessity for food production became urgent, the value of school-directed gardening was recognized by the President of the United States. In February, 1918, he allotted for use in the expansion of this work $50,000 from the appropriation for the National Security and Defense.

In March, 1918, the United States School Garden Army was organized. This change in name did not alter the previous policy, but added to it a patriotic appeal. Two main purposes prompted the planning of the United States School Garden Army: (*a*) Increased food production and (*b*) training of school children in thrift, industry, service, patriotism, and responsibility, and giving them such first-hand knowledge of the forces and phenomena of nature and of plant and animal life as city children can not otherwise get.

To guide this new organization a director was appointed who was responsible for organization and administration of the work. The country was divided into climatic zones and five regional directors appointed. The regional directors were responsible for supervision of the work and the preparation of garden lessons adapted to their respective regions.

The army plan of organization was so simplified that it could be incorporated as a part of the regular school plan, and many schools enlisted their entire enrollment of children of garden age.

At the end of the fiscal year (June 30, 1918) 1,500,000 had enrolled in the United States Garden Army. Twenty-five thousand acres of previously unproductive home and vacant lots were under cultivation. Boards of education and superintendents of schools gave their hearty approval and cooperation. Civic, commercial, and patriotic organizations joined with parents in making the work a success. Letters of indorsement were sent out by governors of States and State educational officials. The work accomplished during the first few months was so successful that the President allotted $200,000 for its continuation during the fiscal year ending June 30, 1919.

This allotment made it possible to enlarge the field force. Twenty-nine assistant regional directors were appointed. As it was impossible to secure immediately the required number of trained persons for this work, not all were appointed at the same time. The average period of service was seven and one-half months. The assistant regional directors were assigned to one or more States on the basis of city population and worked through the offices of the State superintendents of public instruction. In all cases State educational officials gave their full cooperation, and in many instances offices, equipment, and stenographic services were furnished by the State. Commercial, social, and patriotic associations continued to support the work of the United States School Garden Army. Through the active cooperation of many agencies it has been less difficult for superintendents of schools to obtain money to pay for the services of garden teachers and supervisors.

Manuals of lessons in gardening were issued for each region. Over 4,500,000 of leaflets and 750,000 manuals of garden instruction were sent out during the year. Our mailing list for leaflets, manuals, and directions for teaching these are 40,361 garden teachers, of which 36,558 are in the public schools and 3,803 in the parochial schools.

Moving pictures have been made of the Mary Hemenway School Garden of Boston; the school-garden parade in Lexington, Ky.; gardening in Redlands, Calif.; and a three-reel film giving practical instruction in gardening. These films and several sets of lantern slides have had a wide circulation. A special assistant director gave visual instruction in gardening in 25 States. These were given in public and private schools, summer schools, normal schools, colleges, universities, chambers of commerce, women's clubs, and at meetings of the National Education Association and the Department of Superintendence of this association. Audiences varied from

a few dozen to two or three thousands. Over 300,000 persons have seen these films.

The amount of assistance and support given by the public press has been remarkable. Hundreds of newspapers, including metropolitan dailies of international prominence and little four-page papers of the smaller towns, have alike given generously of their space and editorial support. Garden lessons and garden stories have been published as daily and weekly features in the most prominent sections of the leading papers of practically every State in the Union. The enormous total of 25 columns of space has been given by each of hundreds of papers.

News articles, ranging from one column to two and one-half columns in length, have been printed by many papers at frequent intervals throughout the spring and summer, and dispatches have been sent out through the medium of the Associated Press and the United Press.

In addition, many papers published in full the garden pageant entitled "The Victory of the Gardens," while others contained a mention of the pageant and its purpose. The pageant was made the chief feature of the closing exercises at many schools and colleges. Many playground associations have used the pageant at great play festivals in large cities.

Letters of commendation of our lessons and stories have been received from every section of the United States. Apparently food and children have once proved their inalienable right to be known as the "common denominators of mankind."

Up to the end of the fiscal year an enrollment of 1,813,552 was reported for 2,125 cities in the United States. Four hundred and nine cities have not yet reported enrollments, or the reports from these cities were in the hands of the assistant regional directors and have not yet reached this office. The island possessions of the United States and Alaska have an enrollment of 114,334, making the total enrollment 1,927,886 School Garden Army soldiers. Reports are still coming in, and it is fairly certain that the number of gardeners enrolled will reach two and a half million.

For three years one of the bureau specialists has been stationed in the South to make a demonstration of the plan for school-directed home gardening. Eight cities in southern Virginia, the Piedmont section of North Carolina, and in eastern Tennessee were selected. Teachers were employed by the local boards of education to work under the direction and supervision of the bureau specialist after school hours and during the vacation period. In 1917, 3,315 children in these cities produced an average of $10.15 worth of vegetables per child; in 1918 the number of gardeners was increased to 7,869 and the average per child was $19.20; up to September 1 of the present

garden season the children of the same cities have produced an average per gardener of $30.35. While it has been impossible to secure similar figures from a large number of cities, other noteworthy records of production per child are from Richfield, Utah, of 208 gardeners, with an average return of $21.63; Fresno, Calif., with 3,100 children, an average of $15.48.

On the basis of a money return of $19.20 per child, the average for the 1918 garden season in eight southeastern cities, the total value of the products for the present garden year will reach approximately $48,000,000. Many individual children gathered a harvest valued at more than $100.

This plan of school-directed home gardening is of value not alone for its economic results, but it has a large beneficial influence on the life of the child. During the period of the war and reconstruction there has been a spirit of unrest manifested among public-school children. This unrest is accentuated during out-of-school hours, because such periods are largely loafing times for city and town children. The work of the United States School Garden Army in promoting school-directed home gardening has furnished some definite occupation that has made a patriotic appeal and has a definiteness to which the child can tie. Statistics have proven that children who have definite employment are less apt to commit juvenile court offenses and Garden Army members also cause less trouble during the school hours. The value of this work to education has been stated by one of the teachers in the Greensboro, N. C., schools as follows: "Three years ago I was not interested in school gardening, but now, after two years' actual experience teaching it, both in the classroom and as a supervisor, I find that gardening is the real, live subject in the school course. Through it the school and the home, the parent and the teacher are brought together, and it develops in the child those traits of responsibility and of stick-to-it-iveness as nothing else in the school course can."

SCHOOL BOARD SERVICE.

The results of an inquiry made by the Bureau of Education last October indicated that more than 50,000 schools in the United States were without teachers. It also indicated that more than 120,000 new and wholly untrained teachers had been drawn into the public schools of the country, mostly boys and girls barely ahead of the classes they were expected to teach. This unusual shortage of teachers was caused by the draft of men for the Army and of both men and women for industries connected with the war, also by the attraction of higher pay in all kinds of industries and commercial employments.

Calls from all parts of the country came to the Bureau of Education to help relieve this condition. To meet this most critical emer-

gency in our schools the President of the United States, under date of September 30, 1918, allotted $25,000 from the appropriation for the national security and defense to the Secretary of the Interior, who authorized the Commissioner of Education to establish a School Board Service section in the Bureau of Education. The division continued its work until July 1, 1919. During the brief term of its existence it conducted a nation-wide publicity campaign in newspapers and magazines to mobilize the latent teaching forces of the country, called for reports of specific vacancies which this campaign could not fill otherwise, secured a registration of about 20,000 teachers of high grade and of special subjects, and responded to calls for teachers with as many as 15,000 nominations.

In preparation for more effective service it made a partial canvass of colleges, normal schools, and the better class of high schools of the country in order to develop a national directory of competent teachers whose names and credentials might be referred to school boards or heads of institutions reporting vacancies.

As a result of this campaign, it has in its files the records of 14,000 active and 7,000 passive registrants. By the designations "active" and "passive," respectively, is meant teachers who are desirous of changing their locations and those who care only to have their names in the directory.

Classifying these registrants in terms of academic training, it has a directory of nearly 16,000 college and university graduates (75 per cent of total number of names) and 4,200 special teachers—20 per cent of total—manual training, physical training, home economics, etc. (teachers holding not college degrees, but diplomas of technical schools), and 1,050 teachers of rural and graded schools (5 per cent of total).

Cards abstracting the record of each of the 14,000 active registrants were made, and each such registrant has a folder in which his record and all correspondence pertaining to him have been placed. Cards and folders are arranged in exact alphabetical sequence.

The active cooperation of school officials throughout the country has been secured, and their cordial appreciation is evidenced in typical letters in the files. The division has responded to calls for teachers in all grades of schools—elementary, high, normal, technical, colleges, universities—and in every subject of the various curricula.

Since the allotment from the appropriation for the national security and defense would not be available after the end of the fiscal year, an estimate of $40,000 for the continuation of this division through the fiscal year ending June 30, 1920, was submited by the Secretary of the Treasury in the estimates for the sundry civil bill, but no appropriation was made by Congress and the work of the division was discontinued on July 1. Estimates for its maintenance

through the remainder of the fiscal year have been submitted for the deficiency bill now pending in Congress. It is sincerely to be hoped that the amount estimated may be appropriated, since the emergency for which the division was created is little less acute than it was last year, and the need for the kind of service thus rendered by this division is a permanent one which can be met by no other agency.

COMMUNITY ORGANIZATION.

In order that the larger democracies of State and Nation may be effective, intelligent, virtuous, and free, and endowed with the powers of initiative and self-restraint, it is necessary that the final unit in these democracies, the little democracy of the local community, be also effective, intelligent, and free, possessed likewise of the powers of initiative and self-restraint, and that it have the ability to judge wisely of the acts of its representatives in legislative bodies and of its servants in administrative and judicial positions. It is necessary, therefore, that the local community be articulate and able to express itself so that it may be heard by other communities with which it is bound up in common interest. Local communities must also be able to act together for their economic, civic, and political welfare. To these ends the local community must be organized—for acquaintance, instruction, discussion, and cooperation—not on the basis of any class, party, creed, or economic condition, but on the basis of common humanity and citizenship. The meeting place of the organized community should be one in which all its members are equally interested and where all feel equally at home. This should not be a private house, a denominational church building, or the lodge hall of any secret society. The community should be large enough to give a feeling of solidarity and power, but not so large as to make community meetings and cooperation difficult.

The Bureau of Education has for several years been promoting community organization or community center work for the purpose of organizing school districts as communities and using schoolhouses as centers for meetings and for cooperative activities. The slogan has been, "Every community a little democracy; the schoolhouse its capitol." The bureau has avoided and on occasion opposed efforts to bring together other organizations or classes or occupational groups to serve as community organizations. It has also held that schoolhouses and, when desirable, other public buildings should be available for use by the people of the organized community as a right and not as a privilege by permission; that tax moneys should be used in the development and maintenance of community organizations and centers, and that community centers should be administered through responsible public officials.

In this work of the bureau several bulletins have been issued, a large and extensive correspondence has been conducted, and many addresses have been made to local, State, and National meetings and in educational institutions. The interest of city, county, and State school officials has been enlisted. Drafts of bills for State legislation have been prepared. Several State and National conferences have been held.

During the fiscal year for which this statement is made a conference of Federal and volunteer agencies of community organizations was held in connection with the meeting of the National Education Association at Pittsburgh. Two bulletins were prepared and printed: "The Discovery of America," and "Community Buildings as Soldiers' Monuments." The first was prepared for the use of the Treasury in the fourth Liberty loan campaign, and 300,000 copies were distributed. Of the second, 20,000 copies were distributed. A curriculum was prepared for a new department of social ethics and community organization in universities, colleges, and normal schools. Such a department has been established in the North Carolina State College for Women, and one of the bureau's specialists has conferred with the authorities of Columbia University, Harvard University, Simmons College, and George Peabody College for Teachers about the establishment of such a department in these institutions. Courses of lectures on community organization were given during the year in 12 universities, colleges, and normal schools, and more than 50 single lectures were given at local, State, and National meetings. Relations have been established with 42 States for the promotion of community organization, and outline plans for organization and suggested programs for meetings have been distributed.

A new development of the community organization during the year is its use for cooperative buying and selling and the use of community centers as points for collecting and distributing parcels. That this may be done effectively and at a great economic advantage seems now to have been definitely proven by experiments conducted for communication between the community centers in the District of Columbia and other centers near by in Maryland and Pennsylvania. In these experiments the Post Office Department and this bureau are cooperating.

The use of the public school buildings of Bridgeport, Conn., in the fall of 1918 for industrial adjustment demonstrates the widening possibilities of community organization and the use of schoolhouses as community centers. The plans for this use of the Bridgeport school buildings was worked out by the Bureau of Education in cooperation with the public school authorities of that city, the specialist in community organization being detailed for that purpose at the request of the War Labor Board.

EDUCATIONAL EXTENSION.

Educational extension work in some form, through which instruction, training, and inspiration to better and more intelligent living may be brought to the masses of the people, both youth and adult men and women, who are denied the direct benefits of the schools of higher learning, has long been popular in the United States and has done much to raise the general level of intelligence, efficiency, morality, and idealism of the people. The debating society, the lyceum, the Chautauqua, the fair and exposition, the reading circle, the study club, the circulating and traveling library, the correspondence school, the community center, the educational moving picture, agricultural extension and farm demonstration work and university extension work have all had their place and played their part so well that most of them continue to grow in popularity and power. The growing recognition of the value of the various forms of university extension work is indicated by the fact that in the last five years the appropriations for the support of this work in colleges and universities have more than doubled and the number of students has increased more than threefold.

University extension work, other than in agriculture and home economics, is now carried on in some form in 42 States, and in other States plans are being made for beginning it. Nearly one-half of the State universities carry on extension work as an integral part of their service to the States in which they are located and which support them. The annual expenditure for this work is now more than one and a half million dollars. Approximately 120,000 students are enrolled for work in college courses in classes and by correspondence. Two million persons are reached by extension lectures and five and one-half millions by visual instruction in the form of moving pictures, stereopticon slides, and exhibits. Nearly a million are reached by debates and discussions, and 300,000 by extension institutes and by conferences. From their very nature some of these extension education agencies must remain independent and go their own way undirected by any organized public agency, but many of them are capable of being brought together for cooperation and for direction in a way which will make them much more effective than they can ever be, working apart and undirected.

To effect such cooperation and to give such direction constituted the purpose of the Educational Extension Division of this bureau, which was created in December, 1918, and maintained until the end of the fiscal year with an allotment of $50,000 from the President's funds for the national security and defense. For many years the American Library Association, the National University Extension Association, and societies interested in visual instruction, organiza-

tions interested in the promotion of reading and discussion among the people, those interested in community organization, and many other societies had been asking for such help from the bureau as could be given best by such a division. After we entered the war these requests became more insistent, particularly the requests from the National University Extension Association, which several times sent committees to interview the Commissioner of Education, and finally the Secretary of the Interior. It was in response to the requests of this association that the division was finally established.

The main purposes of this division have been—

1. To serve as a clearing house of information on methods of and materials for educational extension and to advise educational extension agencies.

2. To salvage for general and permanent use educational extension methods and materials created and collected by the Government in the war emergency.

For the purpose of these functions the division was organized in four sections, corresponding to the main avenues of extension service already established in many of the States:

1. Extension Teacher.
2. Public Discussion and Library Service.
3. Community Center Service.
4. Visual Instruction.

During the six months of its existence the division distributed to the States some of the many Federal documents, war education courses, and motion-picture films available in the several departments in Washington and gave valuable aid to State universities by distributing data on the methods and activities of the different bureaus. The division sent out statistical data, budgets for extension divisions, digests of educational bills; made available selected "package libraries" for the open-minded, impartial study of such questions as "Government ownership and operation of railroads," "Government control of prices," and "Reconstruction work." It also promoted Americanization by gathering the experience of individuals and societies that had been working among foreigners and making that experience available in summaries to universities and departments of education.

Through the visual instruction section of the division 25,000 stereopticon slides and more than 6,000,000 feet of moving-picture films have been collected, and approximately 4,000,000 feet of films have been edited and distributed to the extension divisions of universities and colleges and State departments of education, and are now in use by them. Among the reels sent out are: Camouflage in Modern Warfare; The Work of the American Engineers: Lumbering in France; Military Communication; Sports and Entertainments for

Soldiers; Transportation of Men and Supplies; The Care of the Wounded; Modern Ordnance; Chemical Warfare; Feeding the Army; Air Service; Keeping the Army Well; Road Building; Mammoth Copper Mines; Come Clean, a dental hygiene film; Making the Desert Bloom; Communications on the Battle Front; The Way Out and Holding On, two films on the rehabilitation of crippled soldiers; Treatment of War Wounds; Work of the United States Coast Guard. Most of these films were produced by the Army War College, the Surgeon General's Office, the Ordnance Bureau, and other bureaus of the War Department, the Committee on Public Information, and other governmental agencies. Arrangements have been made with the National Automobile Chamber of Commerce by which the bureau will have its assistance in producing for distribution films illustrating the value of good roads and methods of road building. The value of this service is indicated by the fact that reports made to this bureau show that already 3,000 schoolhouses have projecting lanterns. School men and women all over the country are asking for help in getting suitable motion-picture films.

For the use of the colleges and universities in 33 States maintaining an information and library service this division served as a clearing house and sent out nearly 15,000 pieces of material on current topics to be included in package libraries.to be lent to clubs, societies, and individuals; publications of the United States Government were brought to the attention of extension workers; comprehensive bulletins in mimeographed form were sent out on the following subjects: Adult Education; A Survey of Public Discussion Work in the States; Exhibit of United States Publications; Budget for Public Discussion Bureaus, Package Libraries, and Club Service.

Directory service was maintained for 18,000 public libraries, through which these libraries were constantly informed about valuable information of publications issued by the administrative departments of the Government. In Library Service, a publication issued at irregular intervals, attractive and intelligible accounts were given of the work of the following Government departments: Agriculture, Commerce, Labor, Treasury, and Interior.

Particular attention was given to the distribution of material valuable in such Americanization work as can be done best by university extension agencies, and about 11,000 pieces of Americanization literature, of concrete and specific value in planning courses in teaching immigrants, were sent to extension agencies interested in this work. Among these were valuable publications on the teaching of English, prepared by the Massachusetts extension department; publications of the California State commission on immigration and housing; publications of the extension divison of Iowa, for work among young people in school and college; a publication of Reed

College, showing results of surveys of American cities in regard to illiteracy, foreign-born population, and other significant items.

A statement of the work of the Community Center Service section of this division is included under the title "Community Organization," elsewhere in this statement, together with the statements of the other community organization specialists of the bureau, with whom specialists in this section cooperated.

Near the close of the fiscal year contracts were made for the preparation of manuscripts on the following subjects relating to educational extension work as promoted and served by this division of the bureau: Class extension work in university extension; organization and financing of correspondence departments in universities and colleges of the United States; correspondence-study work in universities and colleges of the United States; public discussion and information service through university extension; university extension in the United States, its history, progress, theory, and practice; the use of Government resources by libraries; the visual method in group teaching; visual instruction in the United States; distribution and exhibition of materials of visual instruction; the application of commercial publicity and advertising methods to the work of university extension. Most of these manuscripts have now been delivered and will be recommended for publication as bulletins of the bureau.

Educational extension is an organized effort to give to all people who will accept them some of the advantages enjoyed by a very small per cent of the people who are able to attend the institutions of higher learning and profit by their intramural work.

The need for the fullest possible support of such an effort and opportunities for its success on a very large scale are far greater now than ever before in this or any other country, as is clearly indicated by the following facts, and it is to be hoped that ample means may be provided for it:

1. There are now in the United States more than 4,000,000 discharged soldiers, one-half of whom were overseas and all of whom have had impressed upon them in many ways the importance of education. It is a matter of common knowledge that these men, nearly all of them young, are eager to take advantage of all available information for instruction in things pertaining to their vocations, to citizenship, and to general culture. Few of them will or can go to college; practically none of them will enter the ordinary public high school. They are too old for this. Some, but comparatively few, will find their way into special vocational schools and part-time classes in industrial plants. A great majority of them must depend upon such opportunities as can be provided by extension education.

2. The shortening of the hours of labor and the recent increase of wages have given to millions of working men and women time and

means for self-improvement far beyond anything which such men and women have ever known before in this or any other country. The closing of the barrooms throughout the United States has relieved large numbers of them from the temptation to spend their leisure time and their money in various forms of dissipation connected with the barroom. Everywhere these working men and women are eager for instruction, both for improvement in their vocation and for better living and more intelligent citizenship. Not only do they take advantage of such opportunities as are offered them by the organized agencies of education, but in many places they undertake to provide opportunities for themselves on their own time and at their own expense. Few of these have had any schooling beyond the elementary grades.

3. Among the foreign-born population in the United States there are many, both of those who have taken out their citizenship papers and those who have not, who, though able to read and write in English and are otherwise fairly well educated, know nothing of our country, its history, its ideals, the form and spirit of its Government, of the agricultural and industrial opportunities offered in various parts of the country. Much might be done for them through educational extension work.

4. Within the last few years millions of women have been given the franchise and now have all the privileges, responsibilities, and powers of actual citizenship. The adoption of the 19th amendment to the Constitution of the United States will add to these millions millions more. When these women become voters, they will, by their ballots or otherwise, determine wisely or unwisely the policies of municipalities, States, and the Nation. They are conscientious; they realize they need instruction as to the duties and responsibilities of active citizenship and help toward an understanding of the many complex and difficult problems which by their ballot they will help to solve. Through their clubs and various other organizations educational extension workers can do much for them.

5. There are in the United States approximately 12,500,000 boys and girls between the ages of 16 and 21 who are coming to their majority at a time when, in order to make a living and assume the responsibilities and duties of life and citizenship, more knowledge and training are needed than ever before. Two and one-half millions of these attain their majority each year; less than one-eighth will graduate from high school; only a little more than one-fourth will have any high-school education. But a large per cent of them would take advantage of opportunities offered them for further instruction, either in class or by correspondence. Still more of them might be induced to do systematic reading under direction or to attend instructive and educational lectures. Such opportunities

for their instruction might easily be organized on a large scale as a part of educational extension work.

An estimate of $100,000 for the continuation and support of the bureau's Division of Educational Extension was submitted, to be included in the sundry civil bill. Seventy-five thousand dollars was recommended by the Senate committee, and $50,000 was voted in the Senate, but this went out in conference. It is sincerely hoped that the full amount of $100,000 will be included in an early deficiency bill. I would also recommend that Congress make a large appropriation to enable the Federal Government to cooperate with the States in the more adequate support of educational extension work, which should be done as a rule through the State universities. The amount so appropriated should be at least as large as that appropriated by the Smith-Lever Act for cooperation with the States in the promotion of extension education in agriculture and home economics, and, as in the case of this act, on condition that the States duplicate the amount received from the Federal Government.

AMERICANIZATION.

The cooperative agreement between the Secretary of the Interior and the National Americanization Committee of New York, made May 2, 1918, for the purpose of enlarging as a war measure the work which this bureau had been carrying on since April, 1914, with the help of that committee was continued until March 4, 1919, on a budget of approximately $100,000 a year and with a corps of 36 specialists, assistants, and clerks. Among the immediate objects of this work, as set forth in the 1918 Statement of the Commissioner of Education to the Secretary of the Interior, were the following:

1. To give the immigrant better opportunities and facilities to learn of America and to understand his duties to America.

2. To unite in service for America the different factions among the several racial groups and to minimize in each race the antagonism due to old-country conditions.

3. To cement the friendships and discourage the enmities existing among races and to bring them together for America.

4. To bring native and foreign-born Americans together in more intimate and friendly relations.

5. To give native-born Americans a better understanding of foreign-born Americans.

6. To develop among employers a more kindly and patriotic feeling toward foreign-born workmen.

7. To encourage the foreign-born Americans to assist in the work of Americanization and to develop a more patriotic feeling toward the work in which they are engaged.

8. To develop the school as the center for Americanization work for all alike.

For the maintenance of this work two sections of this division were maintained until March 4, one in Washington and another in New York, with offices in the Chemical Building at 29 West Thirty-ninth Street. The section in Washington was charged particularly with the promotion of education of foreign-born residents in this country through classes in schools and industrial plants and in connection with social organizations—a continuation of the work which the bureau had been doing for several years under the title of "Immigrant education."

The personnel of the New York office included editors, research specialists, translators, racial advisers, and clerks. The racial advisers were men of such ability and character and such general knowledge, both of America and of their own people in this country, as to gain for them the confidence of a large number of their fellows. Such advisers were appointed for the Armenian, Persian-Assyrian, Greek, Italian, Jewish, Russian, Polish, French, and English racial groups. Through these racial advisers the office and the commissioner were constantly advised as to the general conditions and needs of persons of these racial groups in this country, of their attitude toward the work of Americanization, the ideals and policies of the Government, and of the best means of reaching them with instruction. They also served as messengers for the bureau, holding conferences of their people, speaking in their lodges and public gatherings, translating material for publication in their foreign-language papers, etc. The work of this section of this division was that of getting the various racial groups in the United States intelligently united behind the American war policies and to induce them to become active participants in war programs, preparing them for a fundamental understanding of citizenship, familiarizing them with the Government's war activities, provisions and needs through war information centers, industrial plants, racial societies, and the foreign-language press, bringing together foreign and native-born residents and employers and employees through the American and foreign press, and securing active cooperation of other Government agencies through which foreign-born residents would be reached.

General conferences of from 20 to 60 representative men of several racial groups were held by the commissioner in New York, and one conference of representatives of more than 30 racial groups was held. Many similar conferences were held by the director of the New York office. More than 100 men of different races were organized into small permanent conference groups, each of which held frequent meetings at the New York office. These men were valuable in helping to work out a sound policy and program of racial relations

and in carrying our message to their own people through conference lectures, articles in the foreign-language press, and by participating in local activities.

Many articles on Americanization were prepared for publication in the English and foreign-language papers and in the house organs of nearly 500 industrial plants. These articles were accepted by papers having a total circulation of more than 5,000,000. The policy, already begun, of appointing Americanization committees composed of both foreign and native born citizens in industrial plants was continued until more than 800 such committees had been appointed and were actively at work. Many of these rendered a very valuable service. The division cooperated constantly with the National Council of Defense, the Liberty Loan Division of the Treasury, the Ordnance Bureau, and the Provost Marshal General's Office of the War Department, and with many other governmental agencies. In midsummer the "Americanization Bulletin," the title of which was later changed to "Americanization," was begun. It was continued through the fiscal year.

For the fuller support of the Americanization work of the bureau $18,000 of the allotment of $150,000 made by the President for the continuation of the publication of School Life and general educational extension work was set aside on January 1, 1919. With this fund the work of the bureau was augmented until March 4 and then continued on a much smaller scale until the end of the fiscal year. When this part of the allotment from the President's fund was set aside for this purpose, a director of Americanization was appointed and five expert community organizers were placed in the field, as follows:

At Albany, N. Y., in charge of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and New York.

At Toledo, Ohio, in charge of Michigan, Ohio, Indiana, and West Virginia.

At Chicago, Ill., in charge of Minnesota, Wisconsin, Illinois, Iowa, and Missouri.

At Philadelphia, Pa., in charge of New Jersey, Pennsylvania, Maryland, Delaware, and the District of Columbia.

In all of the above States, with the exception of Maine and Minnesota, which have not yet been reached, these regional directors made their contact with State officials, heads of State organizations, men and women of large influence, and others. In every State they urged legislative action and were most helpful in a number of instances in having sane legislation provided. They appeared before legislative committees, large State gatherings, and other meetings. They presented the problem to the governors of the various States and secured their sympathetic support for effective legislation.

Nine of the above States have taken some definite legislative action in Americanization, either creating an official charged with the task definitely or placing the work in the hands of some commission or bureau. In view of the fact that education is a fundamental part of Americanization, we have recommended that the work within the States be placed in a branch of the State department of public instruction, but that there be recognition of the fact that Americanization is broader than mere education through books.

In two States the Department of the Interior has named State committees, composed of two representatives of powerful State bodies of various sorts, whose duties are, first, to try to secure State legislative action; and second, to see that the necessary work of Americanization in such States does not go by default pending legislation. In four other States tentative lists have been compiled for the appointment of similar committees.

In all of the States the regional directors eliminated duplication and in many cases friction existing among the agencies at work. They brought about a better understanding of the problem. They made the acquaintance of the key men and women of the State, so that in every State there could be quickly set into motion the machinery of Americanization under the common and definite program.

Although we have tried to avoid entering into particular community projects until the States were first properly organized, yet we have been called into a number of large community undertakings. Some communities, like Toledo, for instance, are organizing the agencies of their city most effectively for a real program of work. Funds have been provided from various sources, classes are being organized in the schools and in the factories, and a program put under way which harmonizes entirely with the plans of the division. In such cities our regional directors were very helpful and in some instances, we believe, saved the cities from mistakes which might have been disastrous to the work.

In the Washington office since January 1 a large amount of the material on Americanization which had accumulated in the bureau has been filed, classified and digested. Mimeographed brochures covering various phases of Americanization, bibliographies, statistics, etc., have been prepared and distributed.

A national conference on Americanization was held in Washington May 12 to 15 and was attended by more than 400 of the leading experienced workers of the country. For the first time the social, the educational, the industrial, and the racial workers met together to consider their common problem. Out of the proceedings of this conference, which were published as a bulletin of the bureau and widely distributed, the director of the division is preparing a textbook on Community Work in Americanization.

As a result of the work of this division of the bureau, the country has obtained a broader and clearer conception of what Americanization means, and its importance has been greatly emphasized. Several States have enacted laws and made appropriations for teaching English and other subjects to foreign-born residents in the public schools and elsewhere. Numerous societies have been organized for the promotion of Americanization work, and many more organized for other purposes have adopted some form of Americanization work as a part of their program. In the 20 Northeastern States, in which are found most of the foreign-born population of the country, a definite and practical program could be quickly initiated and the great State agencies easily mobilized to carry into effect if sufficient funds were at the command of the bureau for that purpose. Left entirely to their own resources, Americanization work by the States and communities will, no doubt, continue in the future as in the past to be sporadic and largely ineffective. The time has come when this work should be undertaken by the Federal Government and the States on a scale comparable to the magnitude of the task and the issues at stake. This can be done if the bill now pending in Congress is enacted into law. This bill would provide an annual appropriation of $14,250,000 for a period of seven years for the teaching of foreign-born residents of the United States to speak, read, and write the English language, or giving them instruction in American geography, history, institutions, and life and ideals, and for the teaching of adult illiterates and near illiterates to read and write and to give them instruction in the beginnings of arithmetic and other subjects necessary for intelligent life and work.

Near the end of the fiscal year, contracts were made for studies and reports on the following subjects: Methods of teaching illiterates; State Americanization; Methods of teaching English to the foreign-born; Training teachers for the foreign born; Progress of education of persons of foreign birth; Community Americanization. Several of these have already been delivered and recommended for publication as bulletins of the bureau. Others will be so recommended as they are received and approved.

PERIODICAL PUBLICATIONS.

To enable the bureau to reach a much larger number of those persons who are directly interested in its work than can be reached through the very limited editions of its reports, bulletins, and leaflets, near the beginning of the fiscal year was begun the publication of two journals: (1) School Life, a 16-page semimonthly journal, of each edition of which approximately 40,000 copies are mailed to universities, colleges, normal schools, State, county, and city

school officers and to libraries and to newspapers; (2) the Americanization Bulletin, the title of which was later changed to "Americanization," a monthly journal of 16 pages, which began with an edition of 10,000 copies, which was increased to 22,000 to meet the growing demand for it by societies and individuals directly interested in the work of Americanization. In December the bureau took over School Service, a semimonthly paper of from 16 to 24 pages, which had been published since early in the fiscal year by the Committee on Public Information, for the purpose of giving teachers and pupils information as to the progress of the war and the more important activities of the Federal Government. This publication was continued by the Bureau of Education until May; 650,000 copies of each number were printed and mailed to all the public and private schools of the United States in quantities sufficient to give one copy to each teacher. After the middle of the year the bureau took over Library Service, a publication which had been begun by the Food Administration and has continued its publication at irregular intervals. The purpose of this publication is to give public libraries constant information about the organization, the activities, and the publications of the various administrative department, bureaus, and boards of the Federal Government. For this information there is great demand, and librarians everywhere have expressed themselves as greatly pleased with this service. The publication of School Life, Americanization, and the Library Service is continued, but it is impossible to continue School Service without a special appropriation of not less than $150,000 a year. Since the very important tasks of giving to children in the schools reliable information about the progress of the world and of creating in them an intelligent interest in the affairs of the Government can not be performed half so effectively by any other agency, it is to be hoped that the means may be furnished at an early date for its revival and continued publication.

COOPERATIONS DISCONTINUED.

The clause in the legislative appropriation bill of 1917, which became effective July 1, 1919, makes it illegal for any governmental official or employee to receive any salary in connection with his services as such official or employee from any source other than the Government of the United States, except as may be contributed out of the treasury of any State, county, or municipality, and forbids any person, association, or corporation to make any addition to or in any way supplement the salary of any Government official or employee for services performed by him for the Government of the United States. Therefore, the cooperation of the Phelps-Stokes fund, through which for more than seven years this bureau had

made very valuable studies in the field of Negro education; the cooperation of the National Kindergarten Association, which had assisted the Bureau of Education in its work of promoting kindergarten education: the cooperation of the National Congress of Mothers and Parent-Teacher Associations, through which the Home Education Division of the bureau had been maintained since May, 1913, and the cooperation of the Child Health Organization of New York, which had for a year been very helpful to the bureau in promoting health instruction and the care of the health of children in schools, were automatically discontinued on that date. The kindergarten work, the work of the Division of Home Education, and the work of promoting the care of the health of children in the schools are reduced in efficiency until such time as Congress shall make good by larger appropriations the loss of this outside assistance.

The Division of Negro Education, or the Division of Education of the Negroes and Backward Races, as it had come to be called, has been wholly discontinued at a time when the need for this work is very great. It is to be hoped that the bureau may soon be enabled to take up this work on a much larger scale and continue it until the more important problems of this very difficult part of the task of public education shall have been solved.

Another loss to the bureau through this law, and one more difficult to supply, is that of the expert services of a number of able men, masters in their particular subjects, who hold positions as professors in such private institutions as Harvard University, Yale University, Columbia University, the University of Chicago, Leland Stanford University, and the George Peabody College for Teachers, and who, without additional pay except the nominal sum of $1 per year, were giving the bureau services of a character which it could otherwise obtain only by paying salaries to its own specialists much larger than the Government scale will permit. Congress might do the country and the cause of education a very great service by so amending this law as to permit this and other Government bureaus to accept limited services from such men in particular lines of work at nominal salaries.

ALASKA.

During the year the field force of the Bureau of Education in Alaska consisted of 3 superintendents, 3 acting superintendents, 121 teachers, 8 physicians, and 11 nurses. Sixty-five schools were maintained, with an enrollment of 3,700.

In October, 1918, following the line of steamship transportation from Seattle, influenza broke out in the coast towns of Alaska and rapidly spread to the interior settlements. Furnishing medical relief to the

native races of Alaska is a duty of the Bureau of Education, but in the great emergency created by the epidemic the bureau could not, by itself, effectively cope with the situation. Governor Riggs, therefore, as executive head of the Territory, accepted the responsibility of directing the fight against the disease and took immediate, energetic, and effective action to check its ravages among the native races of Alaska, as well as among the white people.

The Surgeon General of the Public Health Service authorized Governor Riggs to employ physicians and nurses and to purchase medicines. As a sufficient number of doctors and nurses could not be had in Alaska, 19 physicians and 3 nurses were secured in the State of Washington and sent to southern Alaska on the naval collier *Brutus*. All of the bureau's physicians, nurses, superintendents, and teachers were placed at the governor's disposal and rendered zealous service in fighting the epidemic in the native villages. White people throughout the Territory cooperated heartily. The assistance of the Red Cross was also secured.

The epidemic was especially severe in the Nome and St. Michael regions, where it resulted in the death of at least 850 natives, more than 150 children being left orphans. Among the victims of the epidemic were Mr. Walter C. Shields, who for many years had been superintendent of the work of the bureau in northwestern Alaska; Dr. Frank W. Lamb, physician in charge of the bureau's hospital at Akiak; and Mrs. Harriet T. Hansome, assistant teacher at Hydaburg.

In May, 1919, influenza made its appearance among the Eskimos in the Bristol Bay region and among the Aleuts at Unalaska. As in the previous epidemic vigorous measures were at once taken to combat the disease, the Navy Department sending the *Unalga*, the *Bear*, the *Vicksburg*, and the *Marblehead*, with physicians and nurses, to the stricken districts. In the Bristol Bay region the epidemic caused 440 deaths and in the village of Unalaska 45 deaths. An orphanage is being erected at Kanakanak, in which the bureau will care for about 150 of the destitute orphan children.

In 1911 the bureau entered upon the policy of encouraging the establishment in native villages of cooperative enterprises, financed by native capital and conducted by the natives themselves, under the supervision of the teacher of the local United States public school. Such enterprises are now in successful operation in nine villages in widely separated regions, each of which is bringing prosperity to the village in which it is located. Conspicuous among the undertakings is the Metlakahtla Commercial Co., on Annette Island, in southeastern Alaska, which was organized in 1916 with a capital of $2,295 and 30 shareholders. The auditing of the affairs of the company in January, 1919, showed a capital of $21,140 at that date and a net profit of $13,721. The number of stockholders had increased to 156.

The returns to the natives of Metlakahtla from the Annette Island Packing Co., having fish-trapping privileges within the reserved waters adjacent to Annette Island and permission to erect and operate a cannery on Annette Island, amounted during the season of 1918 to $70,252 for fish royalties, trap fees, labor, and lumber purchased from the local sawmill.

The gratifying results from the lease entered into with the Annette Island Packing Co. at Metlakahtla led to the adoption of similar policy at Tyonek, in southwestern Alaska. For several years canneries and packing companies have provided the natives at Tyonek with fishing equipment and purchased the fish caught. Under this arrangement the Tyonek natives never realized more than $4,000 in a season. Under a lease entered into during January, 1919, with a Seattle capitalist, granting him the privilege of operating a saltery and a fish trap within the Tyonek reservation, the annual income to the natives from royalties and wages paid will be about $10,000.

Congress appropriated $75,000 for the support of the medical work of the bureau among the natives of Alaska during the fiscal year 1918–19. Eight physicians and 11 nurses were employed; hospitals were operated by the bureau at Juneau, Nulato, Kanakanak, Akiak, and Kotzebue; the hospital at Haines was maintained in cooperation with the Woman's Board of Home Missions of the Presbyterian Church. Materials for use in erecting a hospital building at Noorvik, in Arctic Alaska, were shipped from Seattle in June. As heretofore, all teachers in settlements remote from a hospital, physician, or nurse were supplied with medicines for use in relieving less serious illness. The policy of receiving native girls for theoretical and practical training as nurses, inaugurated at the Juneau hospital in 1918, has been successfully pursued.

Reports from the reindeer stations for the past year have not yet been received. Assuming that there has been the usual net increase of 20 per cent in the number of reindeer during the year, there should be approximtely 145,000 reindeer in Alaska June 30, 1919. The magnitude and value of the reindeer enterprise have rendered necessary the employment of an expert in animal industry, who has proceeded to northern Alaska, where he will carefully study the prevention and treatment of diseases among the reindeer, as well as scientific breeding, herding, butchering, and marketing.

On account of the vast extent of the Territory of Alaska, with its villages scattered at intervals along thousands of miles of coast and on its great rivers, the taking of the census of Alaska is an undertaking of great difficulty. Through its superintendents, physicians, and teachers located in all parts of the districts and with facilities for reaching the remote settlements, the bureau will cooperate with

the Bureau of the Census in taking the 1920 census of Alaska. Mr. W. T. Lopp, superintendent of education of natives of Alaska, will, as expert special agent, be in charge of the entire work of the Alaska census.

ANNUAL REPORT AND BIENNIAL SURVEY.

As announced in previous statements, this bureau no longer makes an annual report in the extended form of former reports, but makes a very brief annual report of from 100 to 150 pages, and the more extended Biennial Survey in two volumes—one volume containing an interpretive survey of the progress of education in the United States and all other culture countries, the other volume containing a summary of educational statistics for the United States. A copy of the annual report was submitted in October, as required by law, and was printed. All copy for the Biennial Survey should have been ready by January 1. However, because of lack of clerical help and of labor and time-saving devices in the Statistical Division, much of it was still unfinished at the close of the fiscal year, June 30. This unavoidable delay in the publication of the Biennial Survey greatly reduces its value. It is earnestly recommended that the equipment and clerical assistance necessary to enable the Statistical Division to do this work on time and to render the assistance to all other divisions necessary for the greatest efficiency of the bureau be provided at once. There is now in the bureau much valuable statistical material, collected at considerable cost, which can not be put into shape for printing until this is done.

WAR WORK.

All of the divisions of the bureau continued to do a large amount of war work until the armistice was signed and after, as indicated in the statements of the work of the several divisions. It should also be stated that the bureau cooperated with the War Industries Board in passing on applications of States, counties, and cities and boards of trustees of colleges and universities for permission to erect school buildings and to issue bonds for the same.

NEED FOR LARGER APPROPRIATIONS.

The appropriations for this bureau have never been adequate for the work it should do and for which it was established. The inadequacy is now greater and more keenly felt than ever before. With the ending of the war and the beginning of reconstruction and the new era upon which we are entering a very large part of our educational systems must be reconstructed, and the need is apparent for undertaking on a large scale forms of education the need of which

we were unconscious of until, as by lightning flash, the exigencies of war called our attention to it.

Much of this new work can be promoted effectively only by the generous cooperation of the Federal Government with the States, and there is need of a liberally-supported national agency to inspire, guide, and direct wisely in every reconstruction effort, to the end that our systems of education may be adapted to the accomplishment of all their ends, individual and social, economic and civic and cultural, State and national.

I therefore beg leave to submit again, with modifications and additions, the recommendations previously submitted.

RECOMMENDATIONS.

1. An increase in the salaries of chief clerk, editor, statistician, specialist in land-grant college statistics, specialist in higher education, and other specialists, and the removal of the limit on amount of salaries which may be paid from the lump-sum appropriation for rural education, industrial education, and school sanitation and hygiene and for other purposes. The duties of these positions require the services of men and women of such kind and degree of ability as demand salaries much larger than are now paid in this bureau.

2. An assistant commissioner and a private secretary to the commissioner at salaries large enough to obtain competent persons in both places. The duties of the office make it necessary for the commissioner to visit distant parts of the country and to be absent from the office frequently many days at a time, and the details of the work of the office of the commissioner have increased to such an extent that he has little time for the more important work of formulating policies of the bureau and performing the more important duties which can not be performed by assistants. There should be an assistant commissioner to carry on the work in the office during the absence of the commissioner and to relieve him of much of the routine of office work, and a private secretary for the performance of the ordinary secretarial duties necessary to permit the commissioner to do his work effectively.

3. An assistant editor. The editorial work of the office has increased more than sixfold within the past seven years, and it must increase still more within the next few years. It is now impossible for one editor to perform satisfactorily all the required editorial work. The more careful editing of the reports and bulletins of the bureau which this addition to the editorial staff would make possible would save each year in the cost of printing much more than the salary of an assistant editor.

4. A specialist in foreign and domestic systems of education and an assistant in foreign systems of education. This bureau is undertaking to keep the people of the United States informed as to all important progress in education and in methods of teaching in all countries of the world. The radical revolution in education in most countries which will follow the making of peace and which has already begun in several of the more important nations makes it imperative that this work be done thoroughly and well; if it is not, the educational interest of this country will suffer great and irreparable loss. It can not be so done without the additional assistance indicated.

5. Two additional collectors and compilers of statistics. Material for prompt and reliable statistical reports can not be had by this bureau without occasional visits to State and city education offices and the first-hand study of their returns. For the progress of education in the United States and for such an understanding of State and local systems of education as will promote the desired degree of uniformity, it is very important that this bureau shall, in cooperation with State and city school officers, devise and execute plans for greater uniformity in reporting and assisting the several States in making their reports more comprehensive and complete. This is not possible with the small force the bureau now has for this work.

6. A comparatively large increase in the number of clerks, stenographers, copyists, laborers, and messengers to do the work of the bureau as it is now organized, and a still larger increase to do such additional work of this nature as may be made necessary by any enlargement that may be made in the staff of specialists.

7. An appropriation of $10,000 to equip the bureau with modern labor-saving devices. For the want of such devices the clerical work of the bureau is greatly retarded.

8. An increase of appropriation for traveling expenses for the commissioner and employees acting under his direction. This is necessary to enable them to make original investigations in education in different parts of the country and to disseminate information by meeting with educational associations and other societies interested in education. Without funds sufficient to pay necessary traveling expenses, the bureau can not do its work effectively and must constantly be open to the charge of giving help where expenses can be paid rather than where help is most needed. The act which established the bureau requires that it disseminate information in regard to education and that it assist the States in the establishment of better school systems. Both these, as well as the investigations necessary for the acquiring of knowledge of education, require the frequent presence of the commissioner and other members of the bureau in all parts of the

country. The current appropriation of $75,000 for travel is entirely inadequate.

9. For the printing of the annual report of the commissioner and the bulletins and circulars which should issue from the bureau each year there should be available not less than $100,000. The growing importance of education in our national life, the large expenditures for schools and other agencies of education, the increasing extension and differentiation of education to meet the new and increasing needs of industrial and civic life have created a demand for such information as is contained in these publications in many and widely varied fields of education. From no other source can this demand be supplied than from this bureau, and from this bureau it should be met as fully as possible. This will require the printing of a large number of bulletins each year, and many of these should be printed in much larger editions. The limit of 12,500 copies for any edition of a bulletin should be removed, so that it may be printed in such numbers as in the judgment of the Secretary of the Interior may be necessary. Fifty or a hundred thousand school officers can not be supplied from an edition of 12,500 copies of a bulletin on a subject in which they are all equally interested.

10. Additional specialists in higher education, including education in universities, colleges, schools of technology, schools of professional education, and normal schools. The constant and increasing demands from these schools for the help of the bureau in making surveys and for advice as to their reconstruction and better coordination are larger and far more numerous than the bureau can meet with its present force. There is sepcial need of an able man, familiar with agricultural education and the problems of Negro education in the South, to devote his entire time and attention to the colleges of agriculture for Negroes in the Southern States. Such a man might easily make the use of the $1,200,000 by these schools, of which $282,121 are appropriated by the Federal Government, from 25 to 50 per cent more valuable than it now is.

11. A much larger appropriation for the division of school-directed home gardening. The proper education of many millions of children, and even the possibility of their attending school at all during the years in which attendance at school is most valuable, depend to a very large extent upon the general adoption of the work which the bureau is promoting through this division. It is very important that there should be in the bureau a sufficient number of specialists in this subject to visit all cities, towns, and manufacturing villages in the country, advise with their school officials and teachers, and assist in directing the work of teachers until the plan is well enough understood and there are enough trained teachers so that the work in any city or town may go on without outside direction, or until

the several States have made provision for the direction of the work from their offices of education. The enactment of child-labor laws prohibiting the employment of children under 14 years of age in mills, mines, and quarries must result in enforced idleness of hundreds of thousands of boys and girls and in unnecessary hardships to them and their parents unless there be found for them some form of suitable employment economically profitable and at the same time educational. Results obtained through home and school gardening confirm the belief that both economically and educationally this is one of the very best forms of employment for children between the ages of 8 and 14 years. Results of the increased work of this division made possible by an allotment from the appropriation for the national security and defense of $50,000 for the last quarter of the fiscal year ended June 30, 1918, and an allotment of $200,000 for the last fiscal year show most clearly its value for production and education. If this work can be continued on this scale for a few years more it is believed that it will come to be recognized as an essential part of the school work of cities, towns, and industrial villages, thus enriching the educational life of boys and girls of these communities by an element otherwise impossible for them.

12. An increase in the number of specialists and assistants in rural education and industrial education. The few specialists now employed in these subjects are wholly unable to do more than a small part of the work needed. States are asking for expert advice in regard to school legislation and the improvement of their school systems. States, counties, and local communities want comprehensive and detailed school surveys. There is need and demand for such general and authoritative studies of school administration, courses of study, methods of teaching, and adaptation of the work of the schools to the life and needs of the communities which they serve as can be made effectively only by a large group of men and women of the best ability working under the direction of the Federal Government. The passage of the Federal vocation act—the so-called Smith-Hughes Act—and the creation of the Federal Board for Vocational Education relieves the Bureau of Education to a certain extent of responsibility in regard to vocational education in certain classes of schools and for certain classes of persons, but at the same time it emphasizes the importance of the work which the bureau should do for vocational education in other schools and for other classes of persons and adds in large measures to its responsibilities in regard to these subjects.

13. The addition of two or three specialists to the division of commercial education for the investigation of problems of commercial education and to assist in making plans and finding means for the preparation of our young people for participation in the larger com-

mercial life upon which the country is now entering. The rapid expansion of the foreign commerce of the United States, because of the war and for other reasons more permanent, makes the needs of this division more pressing than when it was first recommended some years ago.

14. More adequate provision for the investigation and promotion of school sanitation and hygiene and the physical education and development of pupils. More than 20,000,000 children spend a good part of their time each year in public and private schools in the United States. They come to these schools that they may gain preparation and strength for life. In many of the schools the heating, lighting, ventilation, and other means of sanitation are so poor that instead of gaining strength for life they have the seeds of disease and death sown in their systems. In many other schools the daily regimen is such as to cause the children to lose a very large per cent of that which they might gain with a better regimen. From State, county, and city school officers, in all parts of the country, thousands of requests come to the bureau for information and advice in regard to these matters. The bureau should be able to give accurate information and sound advice regarding various phases of this subject. The establishment of health and right health habits and the best types of physical education must be considered most important and vital factors in any education that is to fit for life. Provision for such games, plays, drills, and other exercises as will develop physical strength, bodily control, and endurance is essential to the schools of any nation that would maintain for all its citizens a high degree of preparedness for the duties both of peace and of war. Facts revealed by the physical examination of volunteers for the Army and the Navy and of selected men in the Army show most clearly the need for this service.

15. The addition of several specialists and assistants in the division of city-school administration for the investigation of problems of education and school administration in cities and towns. The drift of population to the cities and towns continues, and the proportion of urban population to rural population is increasing rapidly. Almost one-half of the children of the United States now live in cities, towns, and densely-populated suburban communities. In some sections of the country a very large proportion of these children are the children of foreign-born parents. All this adds to the complexity and difficulty of the problems of city-school administration, especially in the larger cities. Many hundreds of requests for advice and information in regard to these problems come to the bureau every year. Within the last few years requests have come to the bureau for comprehensive educational surveys in dozens of cities, and many other cities have appealed to other agencies for work of this kind because

their superintendents and boards of education knew that this bureau was not equipped as it should be to do this work. If the right education of the 12,000,000 children who live in cities is a matter of interest to the Nation as a whole, then this bureau should be enabled to do effectively those things which no other agency can do to assist the school officers and teachers of these cities in making the work of their schools more effective. The large and increasing number of requests for comprehensive surveys of city-school systems and for advice and assistance in the readjustment of courses of study and in regard to other phases of city-school administration make it necessary for the bureau to be able to do the work of this division more effectively if it is to retain the respect of school officers interested in this very large and important part of our school system as a reliable and effective agency for information, advice, and assistance.

16. The establishment of a division with specialists and assistants for the investigation of the education of exceptional children. There are in the United States more than 2,000,000 children whose education requires means varying widely from those in common use for the education of normal children. This includes subnormal children, the deaf, the blind, the crippled, the incorrigible, the diseased, and those whose superiority, general or specific, makes it desirable that they be given special opportunities in particular subjects or for general promotion. These children are to be found in cities, towns, and rural communities alike, and all school officers and teachers have to deal with them. The Bureau of Education can not be considered as performing its duties to all the population with impartiality until it has in its service men and women who can give accurate information and helpful advice in regard to the education of these children.

17. A careful and thorough investigation as to the means of better education of children in their homes and the dissemination of information as to the best methods for the early physical, mental, and moral education of children in the home and for the better cooperation of home and school in the education of children of school age. Children of the United States are in school less than 4 per cent of their time from birth to 21. The home is the primary and fundamental educational institution. Schools and other agencies are only secondary. If education in the home fails, no other agency can make good the failure. With our changing civilization and social and industrial life, there is need for more careful study of education in the home. The cooperative arrangement with the National Congress of Mothers and Parent Teacher Association, by which work of this kind had been maintained on a small scale until the 1st of July of this year, is no longer legal. Congress should make an appropriation sufficiently large to enable it to be con-

tinued and largely extended. If an appropriation is made for educational extension, as recommended elsewhere, this work might well be included with that.

18. Provision for the investigation of the education of adult illiterates and the dissemination of information as to the best methods of teaching illiterate men and women to read and write and of extending the meager education of those who were denied the advantages of the schools in their childhood and youth. According to the census of 1910, there were in the United States more than 5,500,000 illiterate men and women and children over the age when they may be expected to make a beginning in the public schools, and there were many millions more barely able to read and write. This illiteracy is a burden to society and a menace to State and Nation. Within the past few years much interest in the removal of this burden has developed, and from all sides come requests for assistance of many kinds from this bureau. The response to the little attention which this bureau has been able to give to this subject indicates that States, local communities, individuals, and benevolent societies are ready to cooperate heartily with the Federal Government in any reasonable plans which may be devised and presented for this purpose.

19. The work of instructing persons of foreign birth in the English language and in the geography, history, ideals, industrial requirements, and manners and customs of our country—the work generally known as Americanization—is so very important that it should be promoted, both by national and State aid. There are in the United States between thirteen and fifteen millions of persons of foreign birth. Of these approximately 5,000,000 can not read, write, or speak the English language, and approximately 2,500,000 of them can not read or write in any language. Such a large proportion of our population unassimilated constitutes a constant menace. With a sufficient appropriation to assist in paying the salaries of teachers and State and local supervisors and funds for a staff of experts under its immediate direction, the Bureau of Education could promote effectively this work of Americanization, so vitally important to the strength and welfare of the Nation. The passage of the bill now pending in both Houses of Congress for the appropriation of $14,250,000 a year for seven years for the purpose of enabling the Federal Government through this bureau to cooperate with the several States in this and in the teaching of native-born illiterate men and women would have results of incalculable value. It is sincerely hoped that this bill may become law.

20. The value of stereopticon and stereoscopic slides, moving-picture films, and phonographic records in school instruction and for extension education through community organizations, women's clubs, and other societies is well established, and there is need and an

increasing demand for a central agency for the production and circulation of such slides, films, and records. The Bureau of Education, in cooperation with State and city departments of education and institutions of higher learning, might render an invaluable service in this field at small cost. The eagerness with which university extension divisions and other educational extension agencies have responded to the bureau's offer of cooperation in the obtaining and distribution of five or six million feet of films, mostly war and public-health films, indicate what might be done with an adequate appropriation for this purpose.

21. The value of and need for community organization, especially in rural communities, become constantly more apparent, and interest in the subject has extended to all parts of the country. The experience of three years has shown that such organization can be promoted most effectively by the Bureau of Education in cooperation with State departments of education. A community organization in every school district in the United States and their Territories and possessions would be incalculably valuable for the period of reconstruction following the war. It is therefore recommended that the personnel and equipment of the bureau for this work be largely increased. If the appropriation recommended for the Division of Educational Extension in the bureau is made, this work of community organization should be included under it.

22. The immediate establishment of a division of educational extension to continue and expand the work begun in the last half of the last fiscal year by the bureau, with an allotment of $75,000 from the President's fund for the national security and defense. Interest in educational extension work has grown rapidly within the last few years and results already obtained show conclusively its value. The special need for such work now and for the next few years is indicated by the following facts: (1) That of the 4,000,000 recently discharged soldiers, nearly all of whom are eager for opportunities to extend their education for vocational efficiency, for citizenship, and for general culture, few can go to college, and fewer still will enter ordinary high schools, and practically all must depend on such opportunities as the educational extension agencies may offer; (2) that millions of laboring men and women now having shorter hours and receiving larger pay than ever before are eager for opportunities for instruction, especially in things pertaining to economics, civic rights and duties, and better living; (3) that millions of women recently enfranchised, or now about to be endowed with the right of suffrage by the ratification of the Nineteenth Amendment of the Constitution of the United States, are eager for opportunities for instruction in regard to forms of government and civic and political problems; (4) that millions of foreign-born men and women among

us, both of those who have taken out citizenship papers and those who have not, although able to speak, read, and write the English language, need to be instructed in regard to the geography, history, ideals, manners, and customs and industrial and economic opportunities in this country; (5) that two and a quarter million boys and girls are every year attaining their majority and entering the ranks of active citizens with the right of suffrage at a time when the problems of active citizenship are more numerous, complex, and difficult than ever before in our history, and that few of these have had any adequate instruction in the principles of democracy and in regard to the vital problems with which they must deal. Less than one-third of them have had any high-school education and less than one-eighth have graduated from a high school. To respond effectively to the opportunities and needs for extension education thus indicated will mean much for all the economic, civic, and cultural interests of the country. Not only should Congress make an appropriation for the maintenance of a division of educational extension as herein suggested, it should also, I believe, make liberal appropriations for cooperation with the States in promoting extension education in health, trades and industries, civic duties, and general culture, compatible to the appropriations now made for cooperation with the States in extension education in agriculture and home economics.

23. An annual appropriation of $25,000 to enable the Bureau of Education to continue and enlarge its work of studying the problems of the education of Negroes in the United States and the education of backward peoples in the Territories and possessions of the United States. The adaptation of the means of education to these people involve many difficult problems to the solution of which comparatively little attention has been given, but without whose solution much of the money expended from both public and private sources for schools and other means of their education will be lost and their development and progress greatly retarded. When an appropriation is made for the reestablishment of the Division for the Education of Negroes and Backward Peoples the man recommended in section 10 of these recommendations to give his entire time and attention to the colleges of agriculture for Negroes in the Southern States might well be attached to this division instead of to the Division of Higher Education.

24. An appropriation of $40,000 a year to enable the Bureau of Education to continue the School Board Service Division, established and maintained through the last half of the fiscal year with the help of an allotment from the President's fund for the national security and defense, for the purpose of assisting boards of education of city and country schools and boards of trustees of universities, colleges, normal schools, and technical schools in finding teachers of the grade

and kind that are sought from the country at large rather than from local communities. The emergency for the relief of which this division was established is now and will remain for several years almost as great as it was before the signing of the armistice and the beginning of the return of men from the Army and of men and women from the industries connected with the war. The great industrial development which must follow the establishment of peace and the unusually high wages paid in the industries will continue to attract many teachers from the schools, and even when conditions have become more normal there will still be great need for the service which only such an agency as this can render.

25. Means to enable the bureau to cooperate with schools of education in colleges and universities, with normal schools, and with city and county school systems in making important investigations and definite experiments in elementary and secondary school education under scientific control. There is as much need for scientific experiments in education as there is for such experiments in agriculture or engineering. Although we are spending annually many hundreds of millions of dollars on public education, we have little accurate and definite knowledge about the value of various forms of education and methods of teaching, and we can have little more until provision is made for such scientific experiments as are here indicated. With a comparatively small amount of money the bureau might obtain the cooperation of individuals, institutions, and boards of education in making important investigations and experiments in education not otherwise possible without much larger expenditures.

26. Means to enable the Bureau of Education to cooperate with State and county school officers in establishing and maintaining model rural schools for the purpose of demonstrating the value of such forms of rural school organization, management, courses of study, and methods of teaching as may appear to be most desirable to be incorporated in the rural schools of the several States and communities of the United States. A bill appropriating $275,000 a year for this purpose is now pending in the Senate. Its passage would, within a few years, add much to the effectiveness of the rural schools of the several States.

27. A larger appropriation to enable the Secretary of the Interior, in his discretion and under his direction, and with the advice and cooperation of the Public Health Service, to provide for the medical and sanitary relief of the Eskimos, Aleuts, Indians, and other natives of Alaska. Careful investigations made with the cooperation of the Public Health Service some years ago showed the necessity of immediate provision for the care of the health of the natives of this Territory and for the eradication of communicable diseases now

prevalent in different sections of the Territory which, if not put under immediate control, will soon destroy the lives of many of these people and spread among the white settlers. To do what is needed will require an annual appropriation of not less than $125,000. The appropriation for the education of natives in Alaska should be increased to not less than $300,000 to enable the bureau to more fully equip some of the schools and to establish schools in several villages in which none have yet been established, and where there are no agencies for the civilization and the care of the natives, and to enable the bureau to care for and properly educate the large number of orphans whose parents died during the epidemic of influenza last fall and winter.

28. The time has come when the natives in all parts of Alaska should be assisted and directed in the establishment and development of industries of their own which will give them remunerative employment through much of the time in which they are now more or less idle, and by which they may make for themselves a better support and gradually take over the larger part of the cost of their own schools and medical attendance. The success of the reindeer industry in the northwestern part of Alaska and of cooperative stores, fish canneries, sawmills, and other industries in southeastern Alaska show clearly the importance of such assistance. Ten thousand dollars a year judiciously expended for this purpose through the next 10 or 15 years would finally save hundreds of thousands of dollars to the Government by making these people more competent to care for their own needs.

29. For the work which the bureau now does more room is needed, and still more will be needed as its staff of experts and clerks is increased. There is now need for more and better arranged space for the bureau's library, which is increasing from year to year. The Nation needs an educational museum, a kind of perpetual educational exhibit, in which there may be found at any time, properly arranged and catalogued, typical courses of study, samples of school furniture, and equipment of all kinds, specimens of school work, plans and photographs of buildings and grounds, and whatever else may be helpful in enabling students of education and school officers and teachers to gain an accurate and comprehensive knowledge of purposes, methods, and results of education in this and other countries, and assist them in forming ideas for the improvement of their own schools and school work. This museum should, of course, be under the direction of the Bureau of Education and should constitute an essential part of its equipment. The work of the Federal Board for Vocational Education, of which the Commissioner of Education is a member, is so closely related to that of this bureau that it would add to the efficiency both of the board and of the bureau if

they were housed in the same building, so that they might have easy access to the same library and communicate easily with each other; and there are other important activities of the Government which could be carried on more effectively under the same conditions. I, therefore, renew the recommendations contained in previous statements that plans be considered at once for the erection of a building that will afford ample room for the work of the bureau and allied activities of the Government, house the bureau's library, and furnish ample room for such collections of materials as those mentioned above. It would, I believe, be entirely proper that such a building be erected in memorial of the patriotic services rendered by the schools and their teachers and pupils during the great war, and these teachers and children might well be permitted to contribute to the cost of the building.

Respectfully submitted.

P. P. CLAXTON,
Commissioner.

The SECRETARY OF THE INTERIOR.

REPORT OF THE UNITED STATES GEOLOGICAL SURVEY

FORTIETH ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.

GEORGE OTIS SMITH, *Director.*

INTRODUCTION.

The fortieth annual report of the United States Geological Survey is an appropriate place in which to compare the present scope of the work with that of the work done during the first year of this organization. The growth of the Survey is suggested by a comparison of the appropriations for 1918–19, which comprise items amounting to $1,437,745, with the total appropriation of $106,000 for the first year, 1879–80. During the 40 years the personnel has been increased from 39 to 967. The corresponding growth in public functions of the organization, which is one of the oldest of the Federal scientific bureaus, can be inferred from the detailed report of activities which makes up the greater part of this volume. The past year has been the most notable in the Survey's history, as it marked the completion of the period of its largest national contribution, and the later half of the year was largely a time of readjustment of program. It seems opportune, therefore, that the special topics discussed in the pages immediately following should be forward-looking and suggestive of the larger usefulness planned for the Geological Survey in the future.

SPECIAL TOPICS.

READJUSTMENT OF ACTIVITIES.

The special war activities outlined in the Thirty-ninth Annual Report continued until the signing of the armistice, when return to the regular program of scientific work began. The policy that had been adopted—not to change the Survey organization, but simply to adapt it to the emergency needs of the war period—made readjustment easier. No special appropriations had been asked during the war, but the appropriations made for activities that would contribute to the needs of the country in time of peace had been diverted to similar activities that would contribute to its needs in time of war. The geologist limited his field studies to the search for the raw mate-

rials most needed by the war industries, the topographer mapped the areas selected by the General Staff; the hydraulic engineer cooperated with the Fuel Administration in power conservation; the statistician met the country's need for weekly and monthly figures of mineral production under the emergency demand; and the engraver and printer reproduced for both Army and Navy the maps required for their operations.

The changes in personnel incident to 243 separations after July 1, 1918, for Army and Navy service, together with the similar loss of 234 workers during the preceding year, made the administration of the Survey work more difficult, and indeed without the increased efforts of those who remained some of the Survey's contributions to the war program could not have been made. It should be added that the Survey's honor roll of 477 would have been longer had not "deferred classification" been officially asked for some of the more essential members of the organization, against their personal preferences.

With so universal a spirit of full service, only brief record should be made of individual honors. Yet it has been a satisfaction to the whole organization that four Survey members attained the rank of lieutenant-colonel in the Engineer Corps and Coast Artillery. These officers brought to their military duties the special training in geologic and topographic engineering that could have been obtained only in the Geological Survey.

The Chief of Coast Artillery, in expressing his appreciation of the assistance rendered by the Geological Survey, mentioned especially the preparation and publication of the "Manual for the artillery orientation officer," stating that this publication was in great demand during the war, as is shown by the fact that over 40,000 copies were printed and distributed. Other contributions of similar type have since been made by a Survey engineer, Lieut. Col. Birdseye, who has prepared pamphlets entitled "Meridian determination" and "Circumpolar ephemeris" for the Coast Artillery Training Center, Fort Monroe, Va.

Personal letters from Gen. Pershing were received by Lieut. Col. Alfred H. Brooks and Lieut. Col. Glenn S. Smith. The letter to Col. Brooks expressed appreciation of his "loyal and energetic work as a member of the American Expeditionary Forces" and stated that his services as chief geologist were "of a constructive character in a field new to the military service" and that the results of his efforts "were becoming manifest to all." Col. Smith was commended for the "energy and technical knowledge which aided most materially in securing suitable personnel and equipment for the Topographic Service, in training and organization, and in the making of topographic surveys in France."

Citations by the commander in chief of the American Expeditionary Forces have also been received "for exceptionally meritorious and conspicuous services" by

Lieut. Col. Glenn S. Smith, "as director of base printing plants."
Maj. J. H. Wheat, "as instructor, Army Intelligence School."
Maj. William O. Tufts, "in topographical surveying with First Army."
Maj. Herbert H. Hodgeson, "in charge of triangulation work at the front."
First Lieut. James B. Leavitt, "as topographic officer for Sixth American Corps."
Mr. Louis H. Gott, "in drafting section, Topographical Division, Second Section, G. S., G. H. Q."
Maj. Luria L. Lee, "as adjutant, First Battalion, 29th Engineers."
Capt. Albert O. Burkland, "as topographic officer, First Division."
First Lieut. Charles H. Davey, "as instructor, Intelligence School."
First Lieut. Reuben A. Kiger, "as topographical officer," V Corps.
Capt. Oliver G. Taylor, "as topographic officer, First Corps."

Maj. Lee was also awarded the French Croix de Guerre for exceptional service rendered as captain in the 29th Engineers during the Chateau Thierry offensive. A copy of his citation is given below.

GENERAL HEADQUARTERS
of the
French Armies of the East.

STAFF

Personnel Bureau (Decorations)

Order No. 18094 "D" (extract).

With the approbation of the Commander in Chief of the American Expeditionary Forces in France, the Marshal of France, Commander in Chief of the French Armies of the East, cites in the order of the division:

* * * * * * *

Capt. Luria Lyons Lee, 29th Regiment, American Engineers:

Rendered exceptional services to the Geographic Branch of the Army during the battles of July, 1918, in the execution of surveys in the region northwest of Chateau Thierry, giving proof under particularly difficult circumstances of very great competency and untiring energy.

* * * * * * *

At General Headquarters, May 28, 1919.

The Marshal of France,
Commander of the French Armies of the East.
PETAIN.

For original extract:
The Lieutenant Colonel,
Chief of Personnel Bureau.

Capt. A. T. Fowler likewise received the French Croix de Guerre for notable services under the fire of the enemy. A copy of his citation is given below.

GENERAL HEADQUARTERS
of the
French Armies of the East.

STAFF

Personal Bureau (Decorations).

Order No. 18094 "D" (extract).

With the approbation of the Commander in Chief of the American Expeditionary Forces in France, the Marshal of France, Commander in Chief of the French Armies of the East, cites in the order of the division:

* * * * * * *

Capt. Alvah Tennant Fowler, 29th Regiment, American Engineers.

During the period from May to July, 1918, has displayed unusual ability and remarkable energy in the conduct of surveys undertaken for the Service Geographique of the Army, in the region of Tartigny, Folleville, Picardy, pushing the work under fire of the enemy and assuring the rapid execution of the work in bombarded villages.

* * * * * * *

At General Headquarters, May 28, 1919.

The Marshal of France,
Commander of the French Armies of the East.
PETAIN.

For original extract:
The Lieutenant Colonel,
Chief of Personnel Bureau.

A copy of the citation for Lieut. Kostka Mudd, who also received the Croix de Guerre, may be found in the Thirty-ninth Annual Report, on page 10.

INADEQUATE COMPENSATION.

In a highly specialized scientific bureau quality of public service must depend largely upon training and experience. The compensation offered must be such as to attract the best graduates of the universities and to hold those who prove their aptitude for scientific work. The fact that there have been 77 resignations from the scientific force of the Geological Survey during the last year—17 per cent of the force—suggests inadequacy of compensation, and the percentage of resignations in the clerical and nonscientific force was even larger. This statement of course does not include separations to enter military service. In the previous year, however, the resignations of the scientific members were only about a third as many, owing to a patriotic unwillingness to leave the Government service during the war. Yet the separation was only delayed, and this may

be supposed to have caused the 17 per cent loss in the year just closed to be excessive, but this optimistic view is not supported by the number of resignations since July 1, 1919.

The fact that there has been a 19 per cent total (scientific and clerical) "turn over" in the Geological Survey in each of the last two years, not including separations for military service, plainly indicates that the Survey salaries are lower than those paid elsewhere. The criticism that has been aimed at the Survey policy of making its scientific investigations useful undoubtedly finds support in the present commercial demand for geologists who have received the Survey training, yet the universities also continue to look to the Government service for trained specialists. The largest inroad upon the Survey efficiency comes from the oil companies: the final result of the pioneer work of the Federal geologists in applying geologic

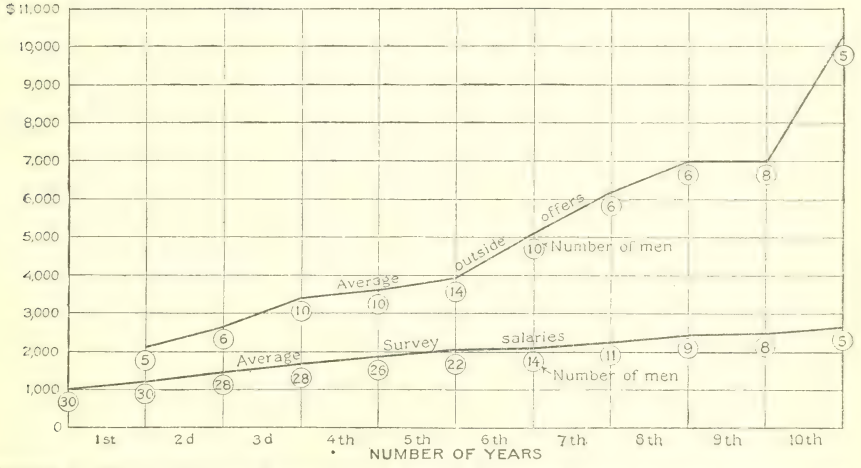


FIGURE 1.—Diagram showing average salaries received by certain Survey geologists compared with the salaries offered to them by outside employers.

methods to the search for oil and gas is that a large proportion of the leading oil geologists the world over are United States Geological Survey graduates. Indeed, the future decline in popularity of the Survey as a recruiting station for oil-company personnel will be due simply to the fact that the experienced oil geologists who remain in the Government service are from personal preference immune to outside offers. How much more attractive is the compensation offered in the commercial practice of geology is shown by figure 1. The curves show the relation between the average outside offers and the average Government salaries paid to oil geologists at the same periods. Of the group of thirty oil geologists of 10 years' experience only two now remain in the Survey. The gap between the curves widens rapidly as the length of experience increases and shows a difference in compensation ranging from $1,000 to $7,000.

The relation between Government salaries and outside salaries of geologists has been definitely determined in a compilation of the records of 29 geologists who left Government service after receiving an average salary of $2,271. The average initial salary of these men in private employ was $5,121, and after about two years of average service this compensation averaged $7,804, and eight of these geologists receive $10,000 or more. The disparity is even greater if consideration is given to the large financial returns from investments made by the private geologists in connection with their professional work, a privilege properly denied by statute to the official geologist.

That the value of these men as specialists and consulting geologists is far greater to the country at large than to private corporations is undeniable. Furthermore, it is important to note that most of these geologists had persisted to the limit of endurance with a magnificent spirit based on their love of scientific research and their desire to contribute to the sum of geologic knowledge. Most of them have been forced out of the service by sheer financial necessity. Unless adequate measures are taken to ameliorate the situation, the geologic staff is destined to suffer far greater deterioration of morale and depletion in its ablest, most responsible, most experienced, and most valuable members. Also it appears that the compensations paid and the inducements presented to-day to the young geologists by this Survey are inferior to those offered by most of the State geological surveys or to those that may be found in the universities, with their distinctive prestige, their long vacations, their sabbatical years, and their adequate provisions for ultimate retirement. The Survey is passing into a stage when, with greater need than ever for systematic geologic work in the country, it is ceasing to be attractive to the young men of greatest ability, training, and promise. This situation deserves prompt and effective remedy, for it threatens most seriously to cripple this branch of the public service.

Increase in Government compensation is not the sole remedy for the present condition. The Government employee is hedged about with restrictions that are especially grievous to one who wishes to make the public service his life work. Some of these are bureaucratic, in part essential to the conduct of work for the benefit of the whole public, but also possibly in part unnecessary hold-overs from past conditions and therefore removable with enlightened administration. Many of the restrictions, however, are of legislative origin, especially those which are fiscal in nature. Not only is the public servant apparently not regarded worthy of his hire, as measured by commercial standards, but he is obliged to conduct his work under conditions of intended economy that do not make for efficiency. A per diem allowance whose limit has not changed with the advancing

cost of living forces the choice of a second-rate hotel, where the Government engineer traveling on official business, for instance, is not likely to meet the professional men with whom to be in touch is a part of his official duty. The only recourse is expenditure of private funds for official expenses, a procedure which aggravates the discrepancy between Government and outside salaries. Other restrictions in Government accounting are so obviously based upon the assumption that the public servant is potentially dishonest as to be a constant irritation to the self-respect of some men who hold the highest ideals of public service. The more confident a man is of his personal integrity the less he likes to be treated as a grafter. Even though such restrictions are necessary in the public service the fact remains that they predispose some of the best men in the scientific bureaus to accept employment under more liberal auspices.

LOSS OF EFFICIENCY THROUGH CROWDING.

The latest restriction put upon efficiency in the scientific service of the Government has been the enforcement of a retrenchment measure whereby scientist and clerk alike are allowed only 75 square feet of floor space each. The inadequacy of this allotment becomes evident when the tools of a working geologist are enumerated—several large cases of rock specimens, map cases, book cases, file cases, as well as his desk and drawing table or bench for simple laboratory tests. The practical arguments against putting two or more highly paid workers in the same room were set forth on pages 7–14 of the Thirty-third Annual Report, and such considerations presented to the congressional committee at that time led to the authorization of the new building, in which the Survey now finds its personnel more crowded than in its old rented quarters. Moreover, many of the special features of the new building designed to facilitate the best work of the scientists lose their highest value under the present conditions. Men who need what are essentially laboratory facilities can not be crowded into the same space as clerical workers and render the service for which they are paid. The loss in efficiency which can not appear on the books of the Treasury will surely several times exceed the apparent saving in rentals; and even worse than that, this crowding now adds to the unattractiveness of Government employment to those who are most needed in the public service.

MAPPING THE COUNTRY.

Several factors have combined to put added emphasis on the country's need of an adequate map of its whole territory. The industrial development of the Nation and the consequent variety of engineering projects of land reclamation, of power generation,

and most recently of highway construction have created a demand for the topographic data that are best displayed by a topographic map based upon accurate surveys; and the war not only called attention to the defenseless condition of much of the country's border area, where the Army had no maps upon which to base its campaigns, but their military experience overseas taught hundreds of thousands of citizen-soldiers how to read and use topographic maps, of the existence of which in their home country they were generally unaware. Thus the engineers, both civil and military, have added their weight of influence to the demand of the educators for faster progress in adequate representation of this part of the geography of our country, and more and more the average citizen is making use of the maps already issued.

With nearly 60 per cent of the area of the country totally unmapped and much that has been mapped in need of resurveys, and with the largest mapping organization in the country surveying only about 40 per cent of the area in 40 years, the logical demand is for more speed. If these maps are to serve their full purpose in promoting national development the whole country must be mapped within this generation, or, even better, within the next decade. The estimated cost of this mapping program is $40,000,000, including the cost of revising the older surveys. To accomplish this work within the period desired would, however, involve more than the appropriation of this amount of money by the Federal and State governments. An organization of specially trained engineers must be built up by means of gradually increased appropriations, beginning with $700,000 for the field season of 1919 and reaching a maximum of $4,500,000 in 1928. It is believed that on such a scale of expenditure the field surveys could be both economically and effectively executed, and the work could be completed in 1932.

The active cooperation of the States in such a program is expected by reason of the increased interest in topographic mapping throughout the country, for counties as well as States are now planning for dollar-for-dollar cooperation with the Federal Government in financing these necessary surveys. In 1917–18 State cooperation reached its lowest ebb, because of the necessary restriction of topographic surveys to areas of military importance selected by the War Department. With this restriction now removed the State funds available for the fiscal year 1919–20 will approach $200,000, and this is the largest amount that has ever been available from that source. Thus with the Geological Survey's appropriation for topographic surveys and the special funds for military mapping contributed by the War Department, approximately $700,000 becomes available for the year beginning July 1, 1919. The return of the engineer officers who made

topographic surveys at the front in France and the increase in the number of assistants to whom had been given special training by the Survey for military service of this type make the trained personnel for the time being more than sufficient to provide for this expansion in mapping, but fortunately this surplus of topographic engineers can be utilized this year in the West Indian surveys mentioned on page 16.

At an engineering conference in Chicago April 25, 1919, the following resolution was adopted:

The Engineers, Architects, and Constructors Conference on National Public Works, composed of the representatives appointed by 74 national, State and local organizations, with an aggregate membership of over 100,000 men, realizes the great importance of adequate maps for the economical planning and construction of a large proportion of engineering works.

With much wisdom the Federal and State governments are now entering upon a program of highway construction which constitutes the greatest engineering project ever undertaken by our Government and which will result in the expenditure of many billions of dollars of public funds in the next decade. This highway construction, as well as many other important public and private engineering undertakings, such as drainage and reclamation projects and others—in the aggregate of tremendous magnitude—demand for economical accomplishment the best type of information such as is afforded by the topographic maps issued by the Federal Government in cooperation with many of the States. These maps are completed for only about 40 per cent of the area of the country. The past rate of progress, if continued, will require between 80 and 100 years to complete the maps for the whole United States.

It is apparent to this conference that by having such maps the saving in the cost of engineering works to be constructed during a very small portion of this time will more than pay for the making of these maps. Therefore, it will be greatly to the public advantage if the completion of these maps can be hastened as rapidly as men can be trained to do the accurate work required.

In view of the foregoing statements, which express the sense of this conference,

Be it resolved: That the facts be presented to the President and to the Congress, and that they be urged to make adequate provision for the entire work of completing the topographic map of the United States in the shortest possible time, compatible with requisite accuracy; and

Be it further resolved, That inasmuch as Engineering Council has already taken up this matter with Federal Government departments, their efforts to hasten the completion of the topographic map be indorsed by this conference and that this resolution be intrusted to them to present to the President, the Secretary of the Interior, the members of the Congress, and to make such other disposition of it as will, in their judgment, further the end desired.

This indorsement of the topographic maps by the engineering profession was a well-considered expression of a general demand for something needed by the members of the engineering organizations represented at the conference. These practical men realize that every dollar of Federal and State funds appropriated for these surveys, if spent in the next ten years, will save many dollars that otherwise must be expended by corporations and individuals in fragmentary surveys made for special purposes, and the worst feature of such an uneconomic procedure would be that it would provide no maps for

the use of the general public. It is therefore an underestimate of the national economy involved to say that the dollar spent in time for this purpose will save nine. The program of mapping the whole country for the use of this generation appears warranted as an essential item in the larger plans for the best use of the Nation's resources.

WEST INDIAN SURVEYS.

An increased appreciation of the value of scientific investigation in planning the wise utilization of natural resources has led several of the West Indian republics to seek the assistance of the United States Geological Survey and to make cooperative agreements with it, whereby topographic and geologic surveys of the islands are to be made at the expense of their governments and the technical supervision of the work is to be assumed by the Survey. The officials of these republics welcome this method of assuring the same quality of mapping for their areas as is obtained in surveys of the United States, and this appreciation of the aid thus given should lead to a larger American participation in the industrial and commercial development that ought to follow this inventory of mineral and land resources.

At the end of the fiscal year a general geologic reconnaissance had been made in the Dominican Republic, and arrangements had been completed for organizing the topographic surveys, field work to begin early in September. In the Republic of Haiti plans were perfected for similar work.

In a special message to the Cuban Congress the President of Cuba has urged an appropriation for the topographic and geologic survey of the island. The cooperative assistance of the Geological Survey has been promised by the Secretary of the Interior to a representative of the Cuban Government as well as in official correspondence, and it is expected that this largest of the West Indian projects will be begun within a year.

A geologic reconnaissance of the Virgin Islands of the United States and a part of Porto Rico with particular reference to groundwater resources was made in May and June. In Porto Rico a topographic survey also is desired by the local government.

A POWER PROGRAM.

Under the war demand for fuel conservation the hydraulic engineers of the Geological Survey served the Fuel Administration in a field study of power problems. The cooperative contribution was both statistical and engineering, and its results showed the fuel requirements of the electrical utilities of the country and indicated where a surplus of power was available, where inadequate power supply could be remedied, and where fuel economies were possible either through interconnection with more efficient plants or substitution of

water power for steam. Thus a power survey of the United States was begun, and with the termination of this cooperation with the Fuel Administration at the end of the war the Secretary of the Interior asked of Congress two appropriations, one of $50,000, for continuing this power survey over the whole United States, and the other of $200,000, for an intensive survey of the industrial zone of the East, where power requirements are most congested.

It appropriately comes within the province of the Geological Survey to plan this power investigation, both because this is the original Federal agency in making the earlier irrigation surveys and because for the last 25 years the Geological Survey has been given annual authorization for "determining the water supply of the United States" and for reporting "upon the best methods of utilizing the water resources." At present in the central power plants of the country water power carries only about 40 per cent of the load, while the total fuel requirement for steam-generated power, including that of the railroads, is not less than 800,000 tons daily. A power program that calls for the immediate and full development of every available and feasible water power, moreover, means saving both in coal and in man power, and with this purpose of securing the double conservation, the investigation has been proposed. The first step is to get the facts for the country as a whole and particularly for the North Atlantic industrial district.

This "super-power" project, which engineers agree seems wholly practicable but which can be regarded as now only in the vision stage, is to pool the power supply for the whole industrial area between Boston and Washington, in which is concentrated one-fourth of the power-generating capacity of the country. Such a unified power system would tie together properly located steam-electric and hydroelectric plants—old plants that are efficient as well as new plants—in a great power main from which would flow the energy to serve a score of railroads, hundreds of public-service companies, thousands of mills and factories, and millions of homes.

The subject is necessarily one for interstate investigation and is linked with the national problem of providing adequate transportation facilities. Electrification of our railroads would effect fuel economies of more than 50 per cent in coal consumed, not to mention the greater efficiency of electric traction through increasing road capacity. Equally important, moreover, is the relation of cheaper power to American industry. As stated in a letter transmitting the estimate for this appropriation, "Only by increased economy in the production and distribution of power will it be possible for our manufacturers to decrease their production expenses and compete successfully in the world's markets, maintaining at the same time the American standard of wages and living."

COMMERCIAL GEOLOGY.

The study of foreign mineral deposits and supplies by members of the Survey staff had for years been incidental to the continued inventory of the mineral production and resources of the United States. During the war, however, this study took on new importance and received special attention; in January, 1918, a preliminary statement of the mineral production of the world had been prepared in atlas form at the request of the Secretary of State, the Bureau of Mines cooperating. Work was then begun on the study of the distribution of the world's reserves of the essential minerals, with the specific intention of furnishing the American representatives at the Peace Conference with the economic data needed for their use. Two general purposes were served—first, that of obtaining a clear understanding of the relations between our own war needs and the foreign sources of supply from which these needs must or could be met; second, that of obtaining an understanding of the bearing of mineral resources upon the origin and conduct of the war and upon the political and commercial readjustment that would follow the end of hostilities. Extensive use was made of the results of the first class by the Government departments that had to do with our foreign trade in its bearing upon domestic industries, notably the War Trade Board, the Shipping Board, and the War Industries Board. The results of the second class were put to immediate use by the Army authorities, by the Department of State, and by the "Inquiry" charged by presidential order with the preparation of economic data for use at the Peace Conference.

The appreciation by the "Inquiry" of the importance of the investigations of foreign mineral resources led to a cooperative agreement between that organization and the Survey and to a small allotment ($7,700) in June, 1918, to permit the employment of additional technical assistance for a period of one year. As the result of this cooperative work a world atlas showing the production of the more important mineral commodities was completed, together with atlases showing the mineral reserves of Europe and of South America, and a large amount of information was compiled in regard to other continents. Most of this information on foreign mineral deposits was compiled from published sources, but the material was enriched by important contributions of unpublished material from the private files of American mining engineers and geologists, and the cooperative relations thus established between the mining public and the Survey have been extended and strengthened as the work progressed.

Formal cooperation with the "Inquiry" terminated on January 1, 1919, and the work was reorganized on a new basis, with only six geologists devoting their time to foreign mineral deposits. At the

same time general instructions were issued to the Survey specialists assigned to work on domestic resources to devote attention to foreign deposits in connection with the domestic investigations, stress being laid upon those foreign deposits which contributed to domestic supplies. At present the working staff of six has been reduced to four, owing to resignations and leaves of absence.

The larger share which the United States must take in international affairs makes it imperative that the public be better informed on these economic subjects, and therefore after the data thus compiled had served the immediate needs of the Government itself and there was no longer any necessity of maintaining the confidential status of most of the information the Secretary of the Interior warmly indorsed the proposal to prepare the material for publication, so as to make it useful to the general public.

The "Atlas of commercial geology," the first part of which is now in press, will exhibit graphically the distribution of mineral production and of mineral reserves. An effort is made to give the necessary world view by means of mineral maps of every continent. The basic importance of the raw-material resources to the country makes it a prime public duty of citizens generally to know the facts regarding the mineral industry, and to ascertain these facts the intensive study of our own resources is not enough; we must also acquire a comprehension of what minerals other countries contain to supplement what we have at home.

If it were possible to construct a composite diagram showing either the current output or the future reserves of the essential minerals in all the countries of the world the graphic exhibit would show so large a centralization in North America as to suggest that here is a group of nature-favored nations. Yet the present industrial demands for fuels, metals, and other mineral raw materials force the American business man to look beyond the present decade and beyond the borders of the United States. Commercial geology is simply the science of geology applied to the problems of industry in terms of trade. The "Atlas of commercial geology" will present the basal facts for use by the business man and thus show the relation of geology to national life.

In connection with the compilation of mineral data for this atlas the Survey geologists have collected detailed information that is of practical use to the mining geologist or engineer in private employ. This material is of various quality, and from its very nature the record can never be regarded as completed and thus ready for publication, but to attain somewhat the same end of publicity an "open file" of mineral information has been established in the Geological Survey. On the cards of this file are recorded in abstract the salient features in regard to foreign mineral deposits—the location and size

of the productive area, the production, the estimated reserves, the grade of the ores, and the nature of the commercial or political control. In addition to this a large amount of information is being compiled as to the recent production, imports, exports, and consumption of mineral commodities in foreign countries and as to recent developments that are of significance to Americans. The mining profession has been notified that this information has been compiled and filed in orderly fashion and is available for the use of American interests. Some of the largest American concerns engaged in the development of foreign mineral deposits have made extensive use of this file and have in turn contributed to it by transmitting material from their own files. The willingness to pool information that has cost many thousands of dollars may be taken as indicative of the get-together spirit of American industry, a type of public service in which it is eminently fitting for the Federal scientific bureau to cooperate.

PUBLICATION POLICY.

The "increase and diffusion of knowledge among men" is an appropriate expression of the object of the Smithsonian Institution, but it expresses no less the most important function of every other scientific bureau. To reach the public with the facts is an essential part of research. The measure of the Survey's success is not simply the number of pages of its official reports or even the quality of these publications, but also the promptness with which these results of scientific work are made public and the degree of publicity given to the useful product of the scientific investigations. To this end, a publication policy has been developed that includes securing newspaper notices of Survey publications, a type of publicity often criticized yet well warranted if the effort is made to advertise not the bureau or its personnel but its product; utilizing mediums of publication other than the official reports, such as the technical journals, transactions of scientific societies, and the reports of State surveys; and answering every inquiry not only by sending carefully selected publications on the subject but by writing more specific information that is not included in Survey reports or referring to the State surveys as sources of further information. Evidence of the success attending this publicity policy is found in the increasing frequency of telegraphic requests for publications or unpublished data.

The Survey's own reports, as described on pages 490–506, must continue to constitute the record of the results of its activities, but that this is not the only record can be seen in the fact that during the year Survey geologists, chemists, and engineers contributed 69 papers for publication outside the Survey, and 15 reports were turned over to the cooperative State surveys for publication. The guiding

test in choosing the place of publication is where can promptest issue and widest circulation be given to the results of the Federal scientific work: publicity under the best auspices is the sole aim.

The wide distribution of the topographic maps has been recognized as absolutely necessary if the public is to receive the benefit of the topographic surveys, but the sale of these maps was interfered with by the war, and at one time, indeed, for military reasons, some of the maps were withdrawn from general sale. There has been an increase, however, during the last year, so that as many maps were sold in June, 1919, as in June, 1915. With the purpose of promoting a larger use of these Government maps in the schools, a set of 25 carefully selected maps showing the various types of country in the United States has been distributed by Members of Congress from their legal quotas. Thus far 3,000 schools have been supplied with this set, and its use in teaching will be facilitated by a brief description of the set by Prof. W. M. Davis, which is sent to these schools. To promote the educational use of the current issues of topographic maps, similar brief descriptions of the maps published during the year appear on pages 506–526 of this report, and these descriptive notes are now included in the monthly list of publications. This innovation in publicity was made in response to the expressed needs of teachers who desire to use the maps best adapted to their classes.

GEORGE FERDINAND BECKER.

Dr. George Ferdinand Becker, the well-known geologist, died in Washington April 20 at the age of 72. He was born in New York City and was the son of Alexander Christian Becker, of Denmark, and Sarah Cary Tuckerman Becker, the daughter of Rev. Joseph Tuckerman, of Boston. Dr. Becker was the last member of the group of distinguished geologists who in 1879 were associated with Clarence King at the time of the organization of the United States Geological Survey. He was a leader in mining geology and geophysics and for many years had been the chief of the division of chemical and physical research in the Geological Survey, and the investigations made under his direction led to the establishment of the Geophysical Laboratory of the Carnegie Institution of Washington.

Dr. Becker was a graduate of Harvard, received the degree of doctor of philosophy at Heidelberg, and later graduated from the Royal School of Mines in Berlin. He was for four years an instructor of mining and metallurgy in the University of California, from which he came to the United States Geological Survey.

Dr. Becker was one of the pioneers in governmental efforts to guide and encourage the development of the mineral resources of the West. In 1880, when essentially the entire technical staff of the Geological Survey was utilized by the Bureau of the Census in taking the census

of mineral production, the statistical work west of Mississippi River was placed in Dr. Becker's charge. A little later his personal solicitation before a committee of Congress was largely responsible for the permanent establishment, under the auspices of the Geological Survey, of the annual statistical canvass of the mineral industry of the country now carried on by the division of mineral resources of the Survey.

In 1880, also, Dr. Becker began the study of the geology of the famous Comstock silver lode, which even at that time had yielded $325,000,000 in bullion and which is imperishably associated with some of the most romantic episodes in American mining. The results of this work were published in monographic form in 1882. He spent the summers of 1883 to 1885 in the study of the quicksilver deposits of California and in connection with these studies made a visit to the famous old Almaden mine in Spain. He was one of the pioneers in the geologic work in the gold fields of southern Alaska, which he visited in 1895.

Dr. Becker's geologic observations and studies were not confined to the United States, however, for in 1896, under the auspices of an English company, he visited the Rand gold fields, South Africa, and some of his observations there were later published by the Geological Survey.

In 1898 he reported to the military governor of the Philippines as geologist, and he spent 14 months in the islands. Although prevented from accomplishing much in the way of active field work because of the hostile attitude of the natives, he was able, during that period, to compile a very useful review of the geology of the islands as known at that time. In connection with this Philippine service Dr. Becker prepared a special report for President Roosevelt on the desirability of scientific explorations in the islands.

Dr. Becker also rendered national service in the Canal Zone as a member of a special committee under the auspices of the National Academy of Sciences, for the purpose of investigating the geologic phases of the engineering problems of the Panama Canal.

Dr. Becker was a member of the National Academy of Sciences, the Washington Academy of Sciences, and the American Institute of Mining Engineers. In 1914 he was elected president of the Geological Society of America. He was the author of more than a hundred scientific papers.

WORK OF THE YEAR.

PUBLICATIONS.

The publications of the year numbered 218 and consisted of 1 annual report, 8 professional papers, 6 separates from 1 professional paper, 21 bulletins, 33 separates from 5 bulletins, 14 water-supply papers, 2 separates from 1 water-supply paper, 61 separates from

3 annual reports on mineral resources, 1 new geologic folio, 1 supplemental list of publications, 1 book entitled "Fiscal regulations of the U. S. Geological Survey," 1 book entitled "Topographic instructions," 1 advance statement on copper in 1918, 3 index-map circulars, 10 texts for back of maps of camps, 42 press bulletins, and 12 monthly lists of new publications. The total number of pages in these publications was 11,644. Brief notices of the publications in the regular series, also of 181 new topographic maps and several reprinted maps showing camps, are given below.

THIRTY-NINTH ANNUAL REPORT of the Director of the United States Geological Survey to the Secretary of the Interior, for the fiscal year ended June 30, 1918. 1918. 163 pages, 4 plates.

A detailed account of the work of the Geological Survey during the fiscal year 1918, including reports from each branch, division, and section, abstracts of the publications of the year, and charts showing contributions to war service by the Survey and its three principal branches. Under the heading "Special war activities" the Director discusses the way in which the personnel, records, and methods that represent the products of many years of scientific activity were being utilized in the prosecution of the war, past experience being thus translated into present service. The number of Survey men in the Army increased during the year from 61 to 332. The special investigations of the year fell into two broad groups relating to war materials and to military surveys. In the search for supplies of war minerals the Survey geologists visited mining districts not only in the United States but in Central and South America and the West Indies. Cooperation with the war boards and other departments was continuous and gradually increased in scope. The Survey took the initiative in organizing a joint information board on mineral products. The spirit of the whole organization is expressed in the sentence "The war has given science a larger opportunity to be useful." The same thought is expressed in the closing words of an obituary notice of one of the original members of the Survey who had rendered continuous service for 39 years: "Pure science as given to the world by Grove Karl Gilbert was useful science."

PROFESSIONAL PAPER 99 (Extract). A description of the quantitative classification of igneous rocks, with tables for the calculation of the norm, by H. S. Washington. 37 pages.

Reprint of the five appendixes to Professional Paper 99, which contain matter of general use to petrographers and mineralogists and in this form will be more readily accessible and more easily handled than in the original bulky volume. A list of errors that have been discovered in that volume is given, and eleven analyses are added.

PROFESSIONAL PAPER 104. The genesis of the ores at Tonopah, Nev., by E. S. Bastin and F. B. Laney. 1918. 50 pages, 16 plates, 22 text figures.

Presents the results of an investigation conducted in informal cooperation between the Geological Survey and the Bureau of Mines. This investigation was intended to supplement the work of Spurr and Burgess, whose reports on the geology of the Tonopah district were published in 1905 and 1909, by applying to the ores methods of microscopic study which were not in general use by economic geologists at the time they wrote but which in other districts have proved of material assistance in the interpretation of ore genesis. Ore was discovered at Tonopah in 1900. In 1915 the district was exceeded in silver output in the United States only by Butte. The total value of the gold, silver, copper, and lead produced in the district to the end of 1917 was over $92,000,000. The authors believe that the ores from which these metals have been derived were in

the main of hypogene origin, having been deposited by solutions that exuded from cooling, buried bodies of igneous rock or magma. The hypogene ore bodies were subsequently subjected to processes of oxidation and enrichment, but these processes, referred to collectively as supergene, were quantitatively much less important than the hypogene mineralization. The paper is illustrated by numerous photomicrographs and other views of the ores.

PROFESSIONAL PAPER 106. The Quaternary geology of southeastern Wisconsin, with a chapter on the older rock formations, by W. C. Alden. 1918. 356 pages, 39 plates, 21 text figures.

Southeastern Wisconsin, now one of the most beautiful of the inhabited parts of the continent, was once an ice field as repellent and featureless as the ice cap of Greenland. The movement of the glaciers in this region in late Pleistocene time gave rise to conspicuous topographic forms and thus left a record of striking individuality. A large ice lobe that advanced through the Green Bay valley and a still greater lobe that crept down the valley of Lake Michigan crowded against each other and pushed the terminal moraines that accumulated on their adjacent sides into one rough, bunchy, gigantic ridge. This joint moraine is the master feature of the region in both scientific and popular interest. Its immense hummocks and hollows suggested to the pioneers the great caldrons they used for boiling down ash lye into potash, and they called it the Potash Kettle Range. Some of the kettles seemed to be set in place, and others to be turned upside down. About 10 years ago this range and other glacial features of eastern Wisconsin were mapped and interpreted by the State Geological Survey. The field work was done at the rate of about 4,000 square miles a year, and thus the survey perforce had something of the nature of a bird's-eye view. The present paper is a work of another order, representing more deliberate methods of investigation and greater attention to detail. The two reports, however, fall into as gratifying accord as is wholesome to the progress of inquiry. This region is particularly interesting to students of glacial phenomena because the topographic conditions, in an area of comparatively small relief, were favorable for the development of nearly all the features that are typical of continental glaciation as contrasted with mountain glaciation. These features are set forth in detail with numerous maps and illustrations. The paper contains an introduction by Dr. T. C. Chamberlin, now of the University of Chicago, under whose direction the studies of the author were carried on. No evidence has been found in the glacial deposits to indicate that man occupied this region before or during the great ice age, and so the study of the effigy mounds and other relics of prehistoric man in the region is outside the province of the geologist.

PROFESSIONAL PAPER 107. Geology and ore deposits of the Tintic mining district, Utah, by Waldemar Lindgren and G. F. Loughlin, with a historical review by V. C. Heikes. 1919. 282 pages, 39 plates, 49 text figures.

The Tintic district, named after a noted Ute chief, is about 60 miles south of Salt Lake City, in the East Tintic Mountains. It is one of the three principal silver-lead districts of Utah and has recently entered the ranks of the great copper camps. The value of the metals produced here from 1869 to the end of 1917 was over $189,000,000. This district was investigated in 1897 by G. W. Tower and George Otis Smith, of the Geological Survey, and their report was published in 1898. The results were also summarized in a folio of the Geologic Atlas of the United States. Since the first report was published the annual production has doubled, the development work has increased enormously, and an entirely new line of ore deposits has been opened. A resurvey was therefore assigned to the authors of the present report, who did most of the field work in 1911, 1913, and 1914. The 14 years between 1897 and 1911 were years of progress in geologic science, and though no great changes in theory or notable discoveries were made

there was a steady improvement in method—a constant trend toward exactness in map delineation and quantitative accuracy in results. This progress is reflected in the new Tintic report. The general geography and geology and some of the mines are discussed by Mr. Loughlin, and the ore deposits by Mr. Lindgren. Mr. Heikes contributes a chapter on the history of mining and metallurgy in the district. The book is abundantly illustrated with maps, sections, and halftone views.

PROFESSIONAL PAPER 108. Shorter contributions to general geology, 1917; David White, chief geologist. 1918. 247 pages, 66 plates, 31 text figures.

Contains 13 papers by 14 authors. These papers were published separately in advance and were noticed in the Thirty-seventh and Thirty-eighth annual reports.

PROFESSIONAL PAPER 109. The Canning River region, northern Alaska, by E. de K. Leffingwell. 1919. 251 pages, 35 plates, 33 text figures.

Prior to the explorations whose results are here set forth the Canning River region of Arctic Alaska was practically unknown except as to its larger geographic features. The region as a whole presented an almost complete hiatus in the scientific knowledge of Alaska, and Mr. Leffingwell has performed a valuable service in mapping and describing its geography and geology. During the 10 years between the organization of his first expedition, in 1906, and the completion of this report his whole attention was given to the work. Capt. Ejnar Mikkelsen was joint commander of the first expedition, but after 1907 the work was done with few companions and no scientific assistants, and on some of his trips the author was entirely alone. The explorations were made at Mr. Leffingwell's own initiative and expense, and the results are in every sense of the word entirely his own contributions to science and to a better understanding of Arctic Alaska. He spent nine summers and six winters on the north shore, pitched camp about 380 times, and traveled 7,000 miles, in addition to the 20,000 miles covered by three round trips between Puget Sound and Point Barrow. The report contains an interesting description of Arctic equipment, sections on meteorology, animal life, history of exploration, and geographic nomenclature, and full discussions of the geography and geology. The results of a detailed study of "ground ice"—bodies of more or less clear ice in permanently frozen ground—form the closing section of the report. The book is elaborately illustrated.

PROFESSIONAL PAPER 110. A geologic reconnaissance of the Inyo Range and the eastern slope of the southern Sierra Nevada, Calif., by Adolph Knopf, with a section on the stratigraphy of the Inyo Range, by Edwin Kirk. 1918. 130 pages, 23 plates, 8 text figures.

The geology and mineral resources of the Inyo Range were investigated by Mr. Knopf in 1912, with the assistance of Mr. Kirk in the study of the stratigraphy. A report on the economic geology of the region was published in 1913, and the work might have stopped there, but in view of the unusual geologic interest of the region further examinations were made in 1913 and the work was extended westward across Owens Valley to include parts of the steep eastern front and the crest of the Sierra Nevada. This region includes a section of the fault zone that divides the Sierra Nevada from the Great Basin, along which movement has taken place up to very recent time. The sedimentary rocks of the Inyo Mountains are more than 36,000 feet thick and range in age from pre-Cambrian to Triassic. In post-Triassic time these beds were faulted and folded, and the region was then invaded by great masses of quartz monzonite and allied rocks. The escarpment of the Sierra Nevada is composed dominantly of intrusive granitic rocks, which are exposed through a vertical range of 8,000 feet. The region has been glaciated at two widely separated periods. The report describes the geologic features in detail and is well illustrated. It includes a sketch of the mineral resources, which comprise lead, zinc, gold, copper, and marble.

PROFESSIONAL PAPER 114. Geology and ore deposits of the Yerington district, Nev., by Adolph Knopf. 1918. 68 pages, 5 plates, 12 text figures.

Yerington is one of the smaller copper districts of the West, its entire output from the beginning of mining operations being less than a third of the annual output of the mines at Bisbee, Ariz. It is, however, next to Ely, the most productive copper district in Nevada and yielded to the end of 1917 more than 61,000,000 pounds. The deposits of this district are exceptionally interesting to the student of ore deposition and differ from those of the more productive western districts in being of contact-metamorphic origin and only slightly modified by enrichment. Mr. Knopf presents a suggestive discussion of the relation of ore deposition to contact metamorphism. The report contains geologic maps and sections and views of fossils and rock specimens.

PROFESSIONAL PAPER 120–B. Geology of northeastern Montana, by A. J. Collier. 1918. Pp. 17–39, Pls. I–VI, figs. 2–6.

Report on a large region in northeastern Montana that has never been thoroughly explored by geologists, owing to the fact that it is a part of the Great Plains and the belief that it is too monotonous and uninteresting to tempt anyone to turn aside from the pronounced geologic features a little farther west. This region has been visited in several reconnaissances by parties from the Geological Survey examining its lignite resources, and the geologic information obtained during these visits is summarized in this paper. Contains a geologic map of the region and views of some of its geologic features.

PROFESSIONAL PAPER 120–D. The structure and stratigraphy of Gravina and Revillagigedo islands, Alaska, by Theodore Chapin. 1918. Pp. 83–100, Pl. VIII, figs. 10–12.

A short report on an area in the southern part of southeastern Alaska that is of geologic interest on account of its fossils.

PROFESSIONAL PAPER 120–F. Relations of late Paleozoic and early Mesozoic formations of southwestern Montana and adjacent parts of Wyoming, by D. D. Condit. 1918. Pp. 111–121, Pls. IX–XIII, fig. 14.

Presents evidence found in southwestern Montana concerning the great Jurassic base-leveling and its bearing on the solution of certain problems involving late Paleozoic, Triassic, and Jurassic formations and sets forth the relations of those formations to beds in western Wyoming.

PROFESSIONAL PAPER 120–G. New graphic method for determining the depth and thickness of strata and the projection of dip, by H. S. Palmer. 1918. Pp. 123–128, Pls. XIV–XVI, figs. 15–19.

Explains a new method of solving trigonometric problems in geologic work by the use of alinement diagrams, which are said to be simpler than logarithmic tables and to give more accurate results.

PROFESSIONAL PAPER 120–H. A contribution to the geology of northeastern Texas and southern Oklahoma, by L. W. Stephenson. 1918. Pp. 129–163, Pls. XVII–XXX.

The region comprising the Black and Grand prairies, in Texas and Oklahoma, abounds in features of physiographic, geologic, and paleontologic interest and has been investigated at different times since 1860. The writer of this paper made studies in the region at intervals between 1911 and 1917, and his purpose is to set forth the present state of geologic knowledge regarding it. The paper contains a geologic map and several halftone illustrations.

PROFESSIONAL PAPER 120–I. Some American Cretaceous fish scales, with notes on classification and distribution of Cretaceous fishes, by T. D. A. Cockerell. 1919. Pp. 165–202, Pls. XXXI–XXXVII.

Fish remains are very abundant in several Cretaceous formations of the Rocky Mountains and Great Plains, but except in the Niobrara formation of Kansas a

fish skeleton well enough preserved for description or identification is the greatest rarity. Most of the fish remains that have been found consist of separate scales, many of which are well preserved. It has been hoped that these scales might prove to be of value in stratigraphic identification and correlation. The scales collected by the Geological Survey in the Western States have recently been studied systematically by Prof. Cockerell, of the University of Colorado, and the results of the study are set forth in this paper. The author discusses the inherent limitations in such a study but states that, as the Cretaceous period saw the rise and development of the higher fishes, with numerous types clearly pointing toward the modern fauna, it is especially desirable to note every fact that will throw light upon the Cretaceous history. The detailed descriptions of the scales are illustrated by heliotype plates.

This pamphlet contains a title-page, table of contents, and index for the use of those who may wish to bind the separate chapters of Professional Paper 120.

BULLETIN 660. Contributions to economic geology, 1917, Part I, Metals and nonmetals except fuels; F. L. Ransome, E. F. Burchard, and H. S. Gale, geologists in charge. 1918. 311 pages, 11 plates, 33 text figures.

BULLETIN 661. Contributions to economic geology, 1917, Part II, Mineral fuels; David White, geologist in charge. 1918. 336 pages, 29 plates, 33 text figures.

Bulletin 660 contains 11 papers by 14 authors; Bulletin 661, 10 papers by 7 authors. These papers, which had previously been published separately, have been noticed in the Thirty-eighth and Thirty-ninth annual reports.

BULLETIN 662. Mineral resources of Alaska, report on progress of investigations in 1916, by A. H. Brooks and others. 1918. 438 pages, 18 plates, 8 text figures.

Contains 15 papers by 11 authors. These papers were published separately during the fiscal year 1917–18 and were noticed in the Thirty-ninth Annual Report.

BULLETIN 664. The Nenana coal field, Alaska, by G. C. Martin. 1919. 54 pages, 12 plates.

The Nenana coal field lies in the rugged northern foothills of the Alaska Range, but most of the coal areas are in lowland tracts between the foothill ridges. Nenana River is followed by the Government railroad now under construction, and one of the principal coal areas of the field has been wholly surveyed and is easily accessible from the railroad, at a point about 360 miles from the coast. The coal lands in this field that are most accessible and contain the most immediately minable coal have been offered for leasing. This report contains a detailed description and map of each township in the field, with classification lists showing coal land and noncoal land.

BULLETIN 666–FF. Our mineral supplies. Quicksilver, by F. L. Ransome. 1919. 9 pages.

Quicksilver is the last mineral to be covered by the series prepared to meet the war need for information on the country's mineral supplies. It was delayed by the pressure of other war work of the author to whom it was originally assigned, but the essential facts were made available to the war boards in other ways.

BULLETIN 666–GG. Our mineral supplies: Bibliography, compiled under the direction of G. M. Wood. 1919. 58 pages.

The final chapter of Bulletin 666. Most of the chapters of this bulletin were published in the spring and summer of 1917. This chapter contains a list of Survey publications concerning deposits of the minerals considered in the other chapters.

BULLETIN 668. The Nelchina-Susitna region, Alaska, by Theodore Chapin. 1918. 64 pages, 10 plates, 4 text figures.

The region described in this bulletin, lying mainly west of Copper River and north of Matanuska River, had before 1913 been visited only by occasional exploration parties and a few trappers and prospectors. In 1913 reports of the discovery

of gold, with the usual exaggeration as to richness and extent of the deposits, attracted several hundred men to the region, but most of them left after they learned the actual conditions. The geology of the region, however, indicates the possibility that gold lodes may be found there and that some of the preglacial gravels that may have survived erosion contain workable placers. The region is now isolated and operating costs would be high, but it will be readily accessible when the Government railroad is completed to the Matanuska coal field, and systematic prospecting may then be justified. This report summarizes the available information concerning the region, the geology and mineral resources of which were investigated by the author in 1914. It contains topographic and geologic maps and views of features of geologic interest. The area discussed covers about 10,000 square miles.

BULLETIN 669. Salt resources of the United States, by W. C. Phalen. 1919. 284 pages, 17 plates, 16 text figures.

In the search for potash carried on by the Geological Survey under specific authority of Congress a great deal of information on the salt resources of the United States has been collected. So much of this information as relates to the geology of the deposits, theories of saline deposition, chemical composition of saline materials, and statistics of production of salt is set forth in this bulletin. The work included chemical examination of hundreds of samples of brines, bitterns, rock salt, and calcium chloride; investigations of the geology of the deposits of rock salt and of the brines; and study of the records of deep wells and of samples of the rocks through which the wells had been drilled. Visits were made to a large number of operating plants in all parts of the country, and the report gives a mass of information that will be of service to everyone interested in the salt industry, which in 1917 produced nearly 50,000,000 barrels of 280 pounds each. The author states that the deposition of salt has probably been taking place during all geologic ages since the early Cambrian, and the deposits of rock salt now found have been formed by the gradual evaporation of bodies of sea water cut off from the main ocean—just such a process as is now going on in Great Salt Lake and the Dead Sea. The report contains a map of the United States showing salt-producing localities, also larger-scale maps of some of the principal localities, geologic maps and sections, and views taken at some of the deposits.

BULLETIN 671. Spirit leveling in New York, 1896 to 1905 and 1912 to 1916, inclusive; R. B. Marshall, chief geographer. 1918. 213 pages, 1 plate.

BULLETIN 672. Spirit leveling in Illinois, 1914 to 1917, inclusive; R. B. Marshall, chief geographer. 108 pages, 1 plate.

BULLETIN 673. Spirit leveling in Kentucky, 1903 to 1914, inclusive; R. B. Marshall, chief geographer. 100 pages, 1 plate.

BULLETIN 674. Spirit leveling in the State of Washington, 1896 to 1917, inclusive; R. B. Marshall, chief geographer. 204 pages, 1 plate.

These bulletins give the results of spirit leveling done by the Geological Survey in the States and during the years named in the titles. Bulletin 674 covers all the leveling done by the Survey in Washington to the end of 1917; the other bulletins are supplementary to bulletins previously published. Most of the altitudes are given to three decimal places.

BULLETIN 676. Some Pliocene and Miocene Foraminifera of the Coastal Plain of the United States, by J. A. Cushman. 1918. 100 pages, 31 plates.

Describes and figures species of Pliocene Foraminifera from five localities in North Carolina, South Carolina, and Florida and all recorded species of later Miocene Foraminifera from the Atlantic and Gulf Coastal Plain between Alabama and New Jersey.

BULLETIN 677. Geology and mineral deposits of the Colville Indian Reservation, Wash., by J. T. Pardee. 1918. 186 pages, 12 plates, 1 text figure.

The Colville Indian Reservation, which is a little larger than the State of Delaware, lies in northeastern Washington, occupying the southern parts of Ferry and Okanogan counties. It is 50 miles northwest of Spokane. This report describes practically all the prominent or promising mines and prospects known in the reservation up to 1913. The detailed descriptions of the four principal mining districts are preceded by a broadly generalized discussion of the geography and geology of the reservation as a whole. The area is bordered on the south by the trenchlike valley of Columbia River, a chasm sunk 1,600 to 2,000 feet below the bordering plains, with somber colonnades, massive dull-gray terraces, rugged promontories, and a great swirling stream below. The east half of the reservation is occupied by steep mountains, but the west half is less rugged. The highest altitudes attained are 6,000 to 6,500 feet. The first metalliferous deposits discovered in this region were gold placers, but most of the mineral production has been in silver. The value of the total output up to 1912 was about $25,000. The mineral deposits of present economic importance are predominantly metal-bearing lodes. This report contains several geologic maps and halftone views.

BULLETIN 680. A geologic reconnaissance for phosphate and coal in southeastern Idaho and western Wyoming, by A. R. Schultz. 1918. 84 pages, 2 plates, 8 text figures.

Report on a brief reconnaissance of an area of about 2,000 square miles in Idaho and Wyoming for the purpose of collecting data for the elimination of lands from existing phosphate reserves if it was found that they contained no valuable deposits of phosphate. As a result of this examination some lands were restored to agricultural entry and some were included in new withdrawals. The net result was a reduction of about 57,000 acres in the outstanding phosphate reserve. A geologic and topographic examination of this area was made in 1872 and another in 1877, by the Hayden Survey. Recent work has disclosed some errors in the geologic maps of the earlier surveys and has brought to light information on previously unvisited parts of the area. Beds of coal have also been found at several localities in this area, and some of them are now being mined. The coal is bituminous and of fair quality. It is used mostly by settlers who live within hauling distance of the mines.

BULLETIN 681. The oxidized zinc ores of Leadville, Colo., by G. F. Loughlin. 1918. 91 pages, 8 plates, 7 text figures.

The Geological Survey early investigated the ore deposits of the Leadville region and in 1886 published an elaborate monographic report on it. This was supplemented in 1907 by a bulletin on the Downtown district of Leadville. The oxidized zinc ores of the region were not exploited until after the Survey's field study of the other ores had been completed. In 1913 Mr. Loughlin was detailed to study these ores, and the present paper gives the results of his examination. It was planned to include this paper as a chapter in a new Leadville monograph, but owing to inevitable delay in the completion of the larger work it was decided to publish this report separately. The shipments of oxidized ores began late in 1910 and by the end of 1916 had amounted to over 650,000 tons, containing from 21 to 31 per cent of zinc. The author discusses the mineralogy, varieties, metal content, distribution, mode of occurrence, and genesis of these ores and gives suggestions for prospecting for them. The book contains photomicrographs of the ores, diagrams, plans, and sections.

BULLETIN 683. The Anvik-Andreafski region (including the Marshall district), Alaska, by G. L. Harrington. 1918. 70 pages, 7 plates.

The coast of Alaska was explored by early Russian and English navigators, but the interior was long wholly unknown, even after a considerable trade in furs had

been established along the coast. The region along the Yukon between Anvik and Andreafski rivers was first visited by white men in 1834, and the earliest geologic work in this part of Alaska was done in 1867. The investigations of the Geological Survey in this region began in 1889, though little detailed work was done until 1896. Since then the region has been visited at intervals, and in the summer of 1916 a topographic and geologic party spent about three months in this part of the Yukon Valley. The information obtained in these explorations is set forth in Bulletin 683, which contains four large maps and several views of the geologic features of the region. Placer gold amounting to $15,000 was obtained here in 1914; in 1916 the output was nearly $700,000.

Bulletin 684. Bibliography of North American geology for 1917, with subject index, by J. M. Nickles. 1918. 154 pages.

A list, arranged alphabetically by authors' names, of publications on the geology of the continent of North America and adjacent islands, also Panama and the Hawaiian Islands, issued in 1917. The book is indexed and contains lists of chemical analyses reported and of minerals, rocks, and geologic formations described.

Bulletin 685. Relation of landslides and glacial deposits to reservoir sites in the San Juan Mountains, Colo., by W. W. Atwood. 1918. 38 pages, 8 plates, 17 text figures.

The urgent demand for water to be used for irrigation on the lowlands adjacent to the San Juan Mountains has led to the construction of a number of reservoirs and the planning of others to store water from melting snows and heavy rain and release it later as needed. Most of the reservoir sites are in the great glaciated canyons of the range, and the selection of some of them has apparently been determined by the occurrence of a narrow gorge or constricted portion in the canyon downstream from a broad, open portion. In some of these canyons, however, the narrow portions have been formed by the deposition of large masses of loose materials of landslide or glacial origin, and such materials have not proved to be water-tight. On many projects perfectly good water-tight dams have been constructed, but serious leakages have occurred underneath or around one end or even both ends of the dam. Some of the projects have therefore been abandoned, and others are kept up with heavy expenses for repairs. Nevertheless other reservoirs were being planned in places where just such loose materials border the dam sites. This paper sets forth the geologic conditions in the canyons and lake basins in the endeavor to preclude expensive errors in selecting future reservoir sites. It is well illustrated and should be of great practical value.

Bulletin 686. Structure and oil and gas resources of the Osage Reservation, Okla. Advance chapters as follows:

A. Introduction, by David White. 1918. Pp. i–xii, Pl. I, fig. 1.

B. T. 23 N., R. 11 E., Tps. 22 and 23 N., R. 12 E., by W. B. Emery. 1918. Pp. 1–9, Pls. II–III, figs. 1–2.

C. T. 27 N., R. 9 E., by D. E. Winchester. 1918. Pp. 11–15, Pl. IV, figs. 1c, 3–4.

D. T. 24 N., R. 10 E., by C. F. Bowen. 1918. Pp. 17–26, Pls. V–VI, figs. 1d, 5.

E. T. 25 N., R. 9 E., by K. C. Heald. 1918. Pp. 27–41, Pl. VII, figs. 1e, 6–10.

F. T. 28 N., Rs. 9 and 10 E., and T. 29 N., R. 10 E., by C. F. Bowen. 1918. Pp. 43–58, Pls. VIII–IX, figs. 1f, 11.

G. T. 25 N., R. 10 E., by D. E. Winchester, K. C. Heald, and others. 1918. Pp. 59–73, Pl. X, figs. 1g, 12–17.

H. T. 25 N., Rs. 11 and 12 E., by O. B. Hopkins. 1918. Pp. 75–90, Pls. XI–XII, figs. 1h, 18–19.

I. T. 26 N., Rs. 9, 10, and 11 E., by F. R. Clark. 1918. Pp. 91–118, Pls. XIII–XVII, figs. 1i, 20–22.

J. T. 20 N., R. 11 E., by E. R. Lloyd and K. F. Mather. 1918. Pp. 119–127, Pls. XVIII–XIX, figs. 1j, 23.

K. T. 27 N., R. 7 E., by K. C. Heald. 1918. Pp. 129–135, Pl. XX, figs. 1k, 24–25.

L. Tps. 24, 25, and 26 N., Rs. 6 and 7 E.; Tps. 25 and 26 N., R. 5 E.; and T. 26 N., R. 4 E., by C. F. Bowen. 1918. Pp. 137–148, Pls. XXI–XXIII, fig. 1l.

M. Tps. 24 and 25 N., R. 8 E., by K. C. Heald and K. F. Mather. 1919. Pp. 149–170, Pls. XXIV–XXVI, figs. 1m, 26–27.

N. Tps. 20 and 21 N., R. 12 E., by C. S. Ross. 1919. Pp. 171–177, Pls. XXVII–XXVIII, figs. 1n, 28–29.

O. Tps. 21 and 22 N., R. 11 E., by C. S. Ross. 1919. Pp. 179–191, Pls. XXIX–XXXI, figs. 1o, 30.

P. T. 24 N., R. 9 E., by K. C. Heald, C. F. Bowen, and others. 1919. Pp. 193–211, Pls. XXXII–XXXIII, figs. 1p, 31–33.

Q. T. 27 N., R. 8 E., by K. C. Heald. 1919. Pp. 213–222, Pls. XXXIV–XXXV, figs. 1q, 34–38.

R. T. 26 N., R. 8 E., by K. C. Heald and K. F. Mather. 1919. Pp. 223–236, Pl. XXXVI, fig. 1r, 39–40.

The Osage Reservation is of particular interest in connection with the search for an increased supply of petroleum, because it contains a great area of unleased oil lands; the productivity of the developed fields is high and well sustained; the reservation contains many anticlines and domes, and the development and tests indicate that most of the structurally favorable folds will yield oil; the oil is of high grade; pipe lines and refineries are at hand; and the lands are being offered for lease. A review of the bonuses already paid shows a regrettable lack of information as to the relative values of the tracts sold and indicates that many of the bidders had little or no geologic guidance. These papers have been prepared to supply the evident need for geologic information regarding the Osage lands. They are brief and practical and are intended for the immediate use of the oil men. Each paper contains a map showing the geologic structure of the area described.

Bulletin 687. The Kantishna region, Alaska, by S. R. Capps. 1919. 114 pages, 17 plates, 6 text figures.

The area of 4,500 square miles described in this bulletin as the Kantishna region lies north of the crest of the Alaska Range, between Nenana and Kantishna rivers, just west of the line of the Government railroad now under construction. It includes the northeastern part of the Mount McKinley National Park, set apart in 1917, and is a short distance north of Mount McKinley, the highest mountain in North America, reaching 20,300 feet. This region was not visited, so far as is known, until 1902, when a Geological Survey party traversed the northwest slope of the Alaska Range and followed Nenana River to its mouth. Several mountaineering parties organized to scale Mount McKinley from the north obtained valuable geographic information on this region, and in 1916, realizing that interest in the region would increase greatly when it became accessible by the new railroad, the Geological Survey sent two field parties there to make topographic and geologic surveys and study the mineral deposits. These parties spent over two months in the region, and the results of their work are here set forth. The report contains topographic and geologic maps on a scale of about 4 miles to the inch (1:250,000) and numerous views showing the topography and natural resources. Probably no other part of North America is so well supplied with wild game, including mountain sheep, caribou, moose, black bear, and many fur-bearing animals. The principal mineral resource of the region is placer gold,

of which about $380,000 worth had been recovered by the end of 1916. Gold and antimony lodes have been worked to a small extent, and the region contains some deposits of lignite.

BULLETIN 688. The oil fields of Allen County, Ky., with notes on the oil geology of adjoining counties, by E. W. Shaw and K. F. Mather. 1919. 125 pages, 10 plates, 10 text figures.

Oil was first found in Allen County, Ky., at about the time of the Civil War, and prospecting was carried on actively in many parts of the county for two or three years after the war, but nothing more was done for 20 years. In 1887 interest was reawakened by the remarkable development of oil and gas in Ohio and Indiana. No great success was attained, and little more was done till 1913, when the high price of oil stimulated renewed search. The results were encouraging, and drilling has continued at an increasing rate. In March, 1917, there were 102 producing wells in Allen County, yielding about 1,400 barrels of oil daily, and by May practically the entire county was under lease. The county contains five well-defined fields, separated by barren strips. Of the 511 wells drilled to the end of 1918, 334 have been successful. The total production is estimated at 100,000 barrels. No pipe line is available, and most of the oil marketed is shipped by rail to refiners at Nashville and Louisville. With better marketing facilities the capacity of the fields would be about 500,000 barrels a year. The total original supply of oil in the three main pools was probably over 3,500,000 barrels, of which only a small fraction has been extracted. This report presents the geology of the county in detail, discusses the economic features of the oil fields, together with notes on adjoining counties, and gives suggestions for prospecting. It is illustrated by several geologic maps, views of geologic features that have a bearing on the occurrence of oil, and a number of well sections.

BULLETIN 690–D. Quicksilver deposits of the Phoenix Mountains, Ariz., by F. C. Schrader. 1918. Pp. 95–109, figs. 8–11.

In 1916 quicksilver was discovered in the Phoenix Mountains, an outlying desert range of the Great Basin type in Maricopa County, south-central Arizona. Other deposits were found later in the year in the same vicinity. This paper sketches the general geology of the area and describes the deposits. The ore averages 3 per cent or more of quicksilver.

BULLETIN 690–F. Some manganese deposits in Madison County, Mont., by J. T. Pardee. 1918. Pp. 131–143.

The deposits of manganese in Madison County, Mont., are primarily of sedimentary origin and therefore differ from most of the other manganese deposits in this general region, which are related to metalliferous quartz veins. Because of their composition these ores are desirable for mixing with the siliceous ores found at many other places in Montana, especially at Butte, where the ores contain less iron than is needed in making high-grade ferromanganese. The author of this paper suggests that because of their sedimentary origin it is worth while to prospect the same beds elsewhere in this general region for manganiferous ores.

BULLETIN 690. Contributions to economic geology (short papers and preliminary reports), 1918, Part I, Metals and nonmetals except fuels; F. L. Ransome, E. F. Burchard, and H. S. Gale, geologists in charge. 1919. 149 pages, 5 plates, 11 text figures.

Contains 6 papers by 6 authors. These papers were published separately in advance. Two of them are noticed above; the others were noticed in the Thirty-ninth Annual Report.

BULLETIN 691–D. Geology and oil and gas prospects of the Lake Basin field, Mont., by E. T. Hancock. 1918. Pp. 101–147, Pls. XVI–XXIII, fig. 31.

The Lake Basin field is an area of about 1,000 square miles in south-central Montana. The town of Billings is at its southeast corner, and it is accessible

from four railways. This paper gives the results of an investigation made for the purpose of studying the stratigraphy of the field in detail and discovering such structural features as have elsewhere been found to bear a definite relation to accumulations of oil and gas. Four deep wells have been drilled in this field, and the author recommends one locality for further tests.

Bulletin 691–E. Oil and gas geology of the Birch Creek-Sun River area, northwestern Montana, by Eugene Stebinger. 1918. Pp. 149–184, Pl. XXIV, figs. 32–34.

The area described in this paper lies adjacent to the front range of the Rocky Mountains in northwestern Montana and is part of a large region in the northern Great Plains that seems to deserve consideration as prospective territory for oil and gas development. Beds of the same age as those that have yielded most of the oil produced in Wyoming and Colorado and large quantities of gas in Alberta underlie much of this region, in many places at depths that can be reached by the drill. This paper presents the field evidence that bears on the prospects of finding oil and gas in the area, including a description of the broader features of the geology and more detailed accounts of local structural features that seem to be possible sources of oil and gas.

Bulletin 691–F. Anticlines in a part of the Musselshell Valley, Musselshell, Meagher, and Sweetgrass counties, Mont., by C. F. Bowen. 1918. Pp. 185–209, Pl. XXV.

Sets forth the results of an investigation made to determine the nature and extent of the rock folds in the Musselshell Valley, Mont., and the possible occurrence of oil and gas in these folds. Several well-developed anticlines and domes were found, and sandstones that would serve as suitable reservoirs for the accumulation of oil were noted at a number of horizons. The report discusses the geology of the region as a whole and suggests the most favorable places for future development. The area described covers about 1,200 square miles and lies on the western border of the Great Plains, its east edge being 10 miles west of Roundup. It is crossed by two railways and is well provided with roads.

Bulletin 691–G. The Nesson anticline, Williams County, N. Dak., by A. J. Collier. 1918. Pp. 211–217, Pl. XXVI.

Describes a fairly well marked anticline that is of interest because it is in an area in which the rocks in general lie nearly flat. A small flow of gas has been obtained in an artesian well a few miles from the crest of this fold, and the author suggests the drilling of one or more additional wells nearer the crest, in search of a larger gas flow.

Bulletin 691–I. The Santo Tomas cannel coal, Webb County, Tex., by G. H. Ashley. 1918. Pp. 251–270, Pls. XXIX–XXXII, figs. 37–41.

The deposit of cannel coal at Santo Tomas, Tex., is the largest body of cannel coal of bituminous rank in the United States, if not in the world. The coal is a low-moisture coal almost as hard as anthracite and is sold on Government contracts under a guaranty of 12,500 British thermal units on "dry coal." It is used on eight railroads in this region. Cannel coal yields oil and gas on distillation, and the amount of coal already in sight in this district warrants its investigation by those interested in chemical industries. The large amount of clay that has to be removed in the mining operations is available for the manufacture of clay products, such as vitrified ware, sewer pipe, draintile, and possibly paving brick. This paper describes the physical features of the region and discusses the coal in detail, with chemical analyses and geologic sections.

Bulletin 691–J. Asphalt deposits and oil conditions in southwestern Arkansas, by H. D. Miser and A. H. Purdue. 1918. Pp. 271–292, Pl. XXXIII.

Describes seven asphalt deposits in Pike and Sevier counties, Ark., one of which is developed by a mine from which asphalt has been shipped in commercial

quantity. As the asphalt is doubtless a residue of crude petroleum, wells have been sunk in this region in the hope of finding oil, but no commercial pools have yet been discovered. The paper contains several detailed logs of deep wells in this region, with geologic interpretations.

BULLETIN 691–K. Coal south of Mancos, Montezuma County, Colo., by A. J. Collier. 1919. Pp. 293–310, Pls. XXXIV–XXXIX, figs. 42–43.

The coal found south of Mancos, Colo., is a relatively pure bituminous coal that is much esteemed as a fuel. Chemical analyses show that its heating value ranges from 10,270 to 14,650 British thermal units. The transportation facilities of the region are poor, but the coal is worked by two mines that supply the local demand. This paper describes the coal beds and gives numerous sections of them.

BULLETIN 691–L. Geology of the Lost Creek coal field, Morgan County, Utah, by F. R. Clark. 1918. Pp. 311–322, Pl. XL, fig. 44.

The Lost Creek coal field is on the main line of the Union Pacific Railroad, about 10 miles northeast of Devils Slide, Utah. Coal has been mined in a small way at several places in this field to supply ranchers, and the deposits were examined by the Survey to determine the possibility of a commercial field in this area and to obtain data for classifying the public land in it. The author of this report concludes that the coal can not be developed profitably except, as in the past, for local use.

BULLETIN 691–M. Structure and oil resources of the Simi Valley, southern California, by W. S. W. Kew. 1919. Pp. 323–355, i-viii, Pls. XLI–XLIV, fig. 45.

Within the last few years considerable activity has been manifested in the development of a small oil field in the Simi Valley, Calif., about 35 miles northwest of Los Angeles and 2½ miles north of Santa Susana, a town on the Coast Line of the Southern Pacific Co. A number of successful wells have been drilled in this field, but comparatively little information has been published on its geology. This paper gives the results of a geologic survey of the field made in 1917 to determine its future possibilities and discover other localities where the structure is favorable for the occurrence of oil. The author makes recommendations as to sites for future test drilling.

This pamphlet contains an index, title-page, table of contents, and introduction for the use of those who may wish to bind the separate chapters of Bulletin 691.

BULLETIN 692–A. The Alaskan mining industry in 1917, by G. C. Martin. 1919. Pp. 1–42, i-xiv.

The first chapter of the fourteenth annual bulletin on the progress of investigations of the mineral resources of Alaska. Contains a preface, an administrative report, a sketch of the Alaskan mining industry in 1917, and a list of recent Survey publications on Alaska. The mineral production of Alaska in 1917 was valued at $40,700,000 and had been exceeded only in 1916, when it was valued at $48,600,000. The decrease was mainly in copper and gold.

BULLETIN 692–C. Mining in Chistochina basin, Prince William Sound region, and Kenai Peninsula, Alaska, papers by Theodore Chapin and B. L. Johnson. 1919. Pp. 137–176, Pl. III, figs. 1–2.

A chapter of the annual progress report on investigations of the mineral resources of Alaska. Contains four papers on the areas indicated in the title.

BULLETIN 693. The evaporation and concentration of waters associated with petroleum and natural gas, by R. V. A. Mills and R. C. Wells. 1919. 104 pages, 4 plates, 5 text figures.

The association of saline waters with petroleum and natural gas has been widely observed, but the origin or mode of formation of these waters has been a perplexing problem. The investigation whose results are presented in this bulletin seems to show that the relatively simple concepts that have prevailed

must give way to the conclusion that the brines are the result of a complex and long-continued evolution in which deep-seated waters from many sources have undergone evaporation and concentration accompanied by noteworthy chemical changes. The field investigations were made during three summers in the Appalachian oil and gas region, but the conclusions are of wide application. Many of the principles set forth by the authors are capable of practical use, and the bulletin is of economic value to oil and gas operators, as well as of scientific interest. It contains numerous chemical analyses, geologic sections, and views of specimens collected from wells. The need of further investigations of this sort is emphasized.

WATER-SUPPLY PAPER 409. Surface water supply of the United States, 1915, Part IX, Colorado River basin; N. C. Grover, chief hydraulic engineer; Robert Follansbee, E. A. Porter, and C. C. Jacob, district engineers. 1918. 236+xxxiv pages, 2 plates.

WATER-SUPPLY PAPER 410. Surface water supply of the United States, 1915, Part X, The Great Basin; N. C. Grover, chief hydraulic engineer; E. A. Porter, H. D. McGlashan, F. F. Henshaw, and G. C. Baldwin, district engineers. 1918. 255+xl pages, 2 plates.

WATER-SUPPLY PAPER 411. Surface water supply of the United States, 1915, Part XI, Pacific slope basins in California; N. C. Grover, chief hydraulic engineer; H. D. McGlashan and F. F. Henshaw, district engineers. 1918. 345+xxxvi pages, 8 plates.

WATER-SUPPLY PAPER 412. Surface water supply of the United States, 1915, Part XII, A, Pacific slope basins in Washington and upper Columbia River basin; N. C. Grover, chief hydraulic engineer; G. L. Parker and W. A. Lamb, district engineers. 1918. 258+xlix pages, 2 plates.

WATER-SUPPLY PAPER 413. Surface water supply of the United States, 1915, Part XII, North Pacific drainage basins, B, Snake River basin; N. C. Grover, chief hydraulic engineer; G. C. Baldwin and F. F. Henshaw, district engineers, 1918. 215+xlix pages, 2 plates.

WATER-SUPPLYP PAPER 414. Surface water supply of the United States, 1915, Part. XII, North Pacific drainage basins, C, Lower Columbia River and Pacific drainage basins in Oregon; N. C. Grover, chief hydraulic engineer; F. F. Henshaw and G. L. Parker, district engineers. 1918. 182+xlix pages, 2 plates.

These papers present in condensed form the results of measurements of stream flow in the basins named in the titles during the calendar year 1915. Data for gaging stations are given under the following heads: Location, Drainage area, Records available, Gage, Discharge measurements, Channel and control, Extremes of discharge, Winter flow, Diversions, Regulation, Accuracy, and Cooperation. The books contain tables giving gage heights and daily and monthly discharges at each station and halftone plates showing typical gaging stations, current meters, and automatic water-stage recorders. Water-Supply Paper 411 contains also views showing measuring apparatus of various types on streams in California. At the end of each book is a list of gaging stations maintained now or in the past in the drainage basins covered and an annotated list of publications by the United States Geological Survey relating specifically to the region, as well as a similar list of reports that are of general interest in connection with hydrology and brief references to reports published by State and other organizations.

WATER-SUPPLY PAPER 422. Ground water in the Animas, Playas, Hachita, and San Luis basins, N. Mex., by A. T. Schwennesen, with analyses of water and soil, by R. F. Hare. 1918. 152 pages, 9 plates, 17 text figures.

The great irrigation works for the storage and distribution of surface water undertaken by the United States Reclamation Service in the arid Southwest—projects that involve the expenditure of millions of dollars, require years for their

execution, and could hardly have been financed by private capital—appeal to the imagination by their very magnitude and have made possible thousands of new homes in a region that was formerly an almost barren desert. But even after developments of this kind have been carried to their utmost limit there will still remain immense areas of unreclaimed arable land. Parts of these remaining areas can be made productive by other means, one of the most promising of which is irrigation with water pumped from wells. Even the most forbidding desert wastes may be underlain by water-bearing deposits, and where the quantity and quality of the water are suitable and the depth to the water table not too great, these supplies may be utilized. The development of such supplies is largely a matter of individual enterprise. Each landowner may own his irrigation system, and the units may be as small as is desired. This feature makes it possible to reclaim with ground water many small, isolated areas in which irrigation with surface water is not practicable. Ground water is being successfully used in this way in the vicinity of Deming, N. Mex., and this paper describes an area of about 3,600 square miles in Grant County, west of Deming, where in several areas the ground water lies at shallow depths. The field work on which the report is based was done in cooperation between the Geological Survey and the New Mexico Agricultural Experiment Station. The report gives definite information in regard to the quantity and quality of the ground water, its depth beneath the surface, and its economic availability for irrigation. The illustrations include maps and diagrams, together with views showing typical features of the area.

WATER-SUPPLY PAPER 425–D. Ground water in Reese River basin and adjacent parts of Humboldt River basin, Nev., by G. A. Waring. 1918. Pp. 95–129, Pls. VII–XII, fig. 4.

Nevada contains a large number of nearly parallel mountain ranges, and the intervening valleys are deeply underlain by gravel, sand, and clay brought down by flood water from the mountain slopes. This unconsolidated valley fill serves as a great reservoir in which much of the water that falls as rain or snow becomes stored, and in some of the valleys this water can be pumped to the surface for use in irrigation. At some places, however, the ground water is too alkaline or too scanty or it lies too deep to make its use successful. It is therefore important that a careful study of the ground-water conditions in any area be made before development is attempted. This report sets forth the results of such a study in a belt about 150 miles long and 12 to 30 miles wide in the central part of the State. It discusses the geology of the belt, with especial reference to the water-bearing formation, gives data on both surface and ground water, and offers practical suggestions for development.

WATER-SUPPLY PAPER 425–E. Ground water in Quincy Valley, Wash., by A. T. Schwennesen and O. E. Meinzer. 1918. Pp. 131–161, i–iv, Pls. XIII–XIV, figs. 5–7.

Reports the results of an investigation made at the request of residents of Quincy Valley, an area of about 600 square miles in Grant County, Wash., to determine whether the area contains an adequate supply of ground water that could be used in irrigation. Discusses the topography and geology of the area and gives data on climate, soil, depth to water, water-bearing formations, quality of water, pumping plants, and irrigation. Concludes that irrigation projects planned to serve more than 15,000 acres are not justified by the facts now available.

This pamphlet contains an index, title-page, and table of contents for the use of those who may wish to bind the separate chapters of Water-Supply Paper 425.

WATER-SUPPLY PAPER 427. Bibliography and index of the publications of the United States Geological Survey relating to ground water, by O. E. Meinzer. 1918. 171 pages, 1 plate.

An annotated list including all publications prepared wholly or in part by the Geological Survey that treat any phase of the subject of ground water or any subject directly connected with ground water. The list comprises 454 volumes, all but 12 of which were published by the Geological Survey. The book contains a full subject index to these publications and a map of the United States showing areas covered by them.

WATER-SUPPLY PAPER 428. Artesian waters in the vicinity of the Black Hills, S. Dak., by N. H. Darton. 1918. 64 pages, 13 plates, 11 text figures.

The foothills and plains adjoining the Black Hills in western South Dakota are semiarid, and their development has been retarded by the scarcity of water. Surface waters are meager and at most places are considerably mineralized. Springs are rare, and as much of the area is underlain by clay or shale the water from most shallow wells is scanty and poor. Fortunately the area is underlain at greater depth by sandstones that receive water at their outcrops in the Black Hills and will yield it when tapped by wells. To make the best use of these water-bearing beds a knowledge of the general geology of the region is necessary. This report gives a description of the geology, with cross sections, a map, and halftone views, and sets forth in detail the conditions bearing on the occurrence and recovery of underground water. The few deep wells that have been put down in this area have been so satisfactory that they offer great encouragement for further drilling.

WATER-SUPPLY PAPER 432. Surface water supply of the United States, 1916, Part II, South Atlantic and eastern Gulf of Mexico basins; N. C. Grover, chief hydraulic engineer; G. C. Stevens and W. E. Hall, district engineers. 1918. 58+xxvi pages, 2 plates.

WATER-SUPPLY PAPER 433. Surface water supply of the United States, 1916, Part III, Ohio River basin; N. C. Grover, chief hydraulic engineer; A. H. Horton and W. E. Hall, district engineers. 1918. 205+xxxii pages, 2 plates.

WATER-SUPPLY PAPER 435. Surface water supply of the United States, 1916, Part V, Hudson Bay and upper Mississippi River basins; N. C. Grover, chief hydraulic engineer; W. G. Hoyt and A. H. Horton, district engineers. 1918. 207+xxix pages, 2 plates.

WATER-SUPPLY PAPER 441. Surface water supply of the United States, 1916, Part XI, Pacific slope basins in California; N. C. Grover, chief hydraulic engineer; H. D. McGlashan and F. F. Henshaw, district engineers. 1918. 330+xxxvi pages, 2 plates.

WATER-SUPPLY PAPER 465. Surface water supply of Hawaii, July 1, 1916, to June 30, 1917; N. C. Grover, chief hydraulic engineer; G. K. Larrison, district engineer. 1918. 191 pages.

Similar in scope to Water-Supply Papers 409 to 414, noticed on page 35.

MINERAL RESOURCES OF THE UNITED STATES, 1916. Eight advance chapters.

MINERAL RESOURCES OF THE UNITED STATES, 1917. Fifty advance chapters.

MINERAL RESOURCES OF THE UNITED STATES, 1918. Three advance chapters.

GEOLOGIC FOLIO 208. Colchester-Macomb, Ill., by Henry Hinds. 1919. 14 folio pages of text, 4 maps, 14 text figures.

The Colchester and Macomb quadrangles cover about 455 square miles in McDonough and adjoining counties, western Illinois. They form a part of the Glaciated Plains province, whose surface consists largely of unconsolidated glacial drift left by the great ice sheets that invaded the region in Pleistocene time. The drift deposits cover by far the greater part of these quadrangles to a depth of 50 feet or more, but older, consolidated rocks crop out in many of the valleys, and still older formations have been reached by the drill. The principal mineral

resources of the quadrangles are clay, shale, and coal. The annual output of clay products is now valued at more than half a million dollars, and the area contains deposits of material that would be suitable for other clay products which are not now manufactured. Coal mining was formerly the chief industry of the area, and 50 years ago the annual shipments from Colchester alone amounted to 500,000 short tons. The coal compares favorably in quality with that of other fields in Illinois and adjacent States. The production is now comparatively insignificant. The soils of this area are exceptionally fertile, and most of the inhabitants are engaged in farming. Several railroads traverse the region, and no part of it is more than 15 miles from a shipping point. This folio gives an outline of the geography and geology of the Glaciated Plains province and describes the two quadrangles in detail. It is illustrated with halftone views and geologic sections and contains topographic and geologic maps.

TOPOGRAPHIC AND OTHER MAPS as follows:

Alabama.

Camp McClellan. Scale, 1 inch=2 miles; contour interval, 50 feet.

Map of the Anniston quadrangle showing by red overprint the location of Camp McClellan. A text prepared by F. E. Matthes, printed on the back of the map, gives an account of the more conspicuous natural features of the region.

Alaska.

Juneau and vicinity. Scale, 1 inch=$\frac{3}{8}$ mile; contour interval, 50 feet.

Map, in great detail, showing Juneau, the capital of Alaska, on Gastineau Channel, and the neighboring mountains, in which have been found valuable deposits of gold that have made the region famous throughout the world. The positions of all the mines are shown on the map, together with the surface developments, such as mills, ditches, power lines, and, by no means of least interest, the positions of several of the underground adits, some of which are more than a mile long. The hills rise steeply from sea level and carry numerous glaciers near their summits.

Arizona.

Chiricahua. Scale 1 inch;=1 mile; contour interval, 50 feet.

Map of part of the north-south Chiricahua and Peloncillo mountain ranges, which are separated by a lowland, San Simon Valley, in which the streams wither away without forming a main stream. This lowland affords a good route which has been utilized by the El Paso & Southwestern Railroad, and the Borderland Highway. (Partly in New Mexico.)

Perilla. Scale 1 inch=2 miles; contour interval, 100 feet.

Map of a strip of country about 12 miles north of the Mexican boundary, characterized by more or less isolated mountain groups separated by wide lowlands in which are some irregularly distributed low hills that look as if they were partly submerged in outwash from the mountains in a region so arid that practically none of the streams are perennial. (Partly in New Mexico.)

Ray and vicinity. Scale, 1 inch=$\frac{1}{2}$ mile; contour interval, 25 feet. (Resurvey.)

Map, on a very large scale, of the celebrated copper camp of Ray, which is in the south-central part of the State. The map shows a great number of mine shafts and prospects and the many settlements that have sprung up in connection with the mining industry.

Arkansas.

Camp Pike. Scale, 1 inch=2 miles; contour interval, 50 feet.

Map of the Little Rock quadrangle showing by red overprint the location of Camp Pike and Fort Logan H. Roots. A text prepared by L. W. Stephenson and H. D. Miser, printed on the back of the map, gives an account of the more conspicuous natural features of the region.

California.

Berenda. Scale, 1 inch=½ mile; contour interval, 5 feet.

Large-scale map of part of the Great Valley of California southeast of Merced and east of San Joaquin River. The straight course of the Southern Pacific Railroad indicates the slight amount of relief.

Bliss Ranch. Scale, 1 inch=½ mile; contour interval, 5 feet.

Large-scale map of part of the nearly flat plain east of San Joaquin River, in which there are no through-flowing perennial streams, no villages, few roads, and only 16 houses.

Bradley. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the hilly region traversed by Salinas River and its tributaries Nacimiento and San Antonio rivers. The highest points are about 1,500 feet above the main stream, whose surface is about 500 feet above the sea.

Bryson. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of the hilly country rising to a maximum elevation of 3,025 feet, parallel to the general trend of which flow Nacimiento and San Antonio rivers—the former in a narrow valley whose floor the stream nearly completely fills, the latter in a valley whose floor is many times the width of the stream.

Chowchilla. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map, on large scale, of part of the nearly flat southwestward-sloping plain of the Great Valley of California, on which a boom town, laid out extensively and with mathematical precision far in advance of settlement, was the starting point of an unsuccessful railroad project.

Collinsville. Scale, 1 inch=½ mile; contour interval, 5 and 10 feet.

Map, on large scale, of junction of Sacramento and San Joaquin rivers and the dissected upland to the north known as the Montezuma Hills. Both rivers have built natural levees along their courses so that the flood plain is higher near them than it is farther away. Much of Sherman Island, which lies between the two rivers, is therefore below sea level, some of it as much as 8 feet.

Denverton. Scale, 1 inch=½ mile; contour interval, 5 and 10 feet.

Map of a small part of Suisun Bay, the marshy flats adjacent to it, through which meander tortuous sloughs, and several groups of rugged hills, like the Potrero and Kirby hills, which rise as islands above the swampy lowland.

Fairview. Scale, 1 inch=½ mile; contour interval, 5 feet. (Part of quadrangle.)

Map of an area of strongly marked, narrow north-south ridges, probably due to the structure of the rocks, separated by narrow lowlands, together forming the western boundary of the gently sloping plain of the Great Valley of California. There are no perennial streams in the area.

Goodsprings. See Nevada.

Haystack Mountain. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map, on large scale, of dissected hilly country, from 300 to 1,000 feet high, east of the Great Valley of California. Numerous knobs, like Haystack Mountain, rise abruptly several hundred feet above the more level lower country in a region practically devoid of perennial streams.

Honker Bay. Scale, 1 inch=½ mile; contour interval, 5 and 10 feet.

Map of part of Suisun Bay and the mouth of Sacramento River. To the north of the bay are extensive salt-water marshes, some of which have been inclosed by artificial levees; to the south of the bay are narrow marshes above which rise the outwash slopes and foothills of the Diablo Range.

Ingomar. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of part of the broad flood plain of San Joaquin River, much of which is occupied by temporary lakes. Throughout the area are numerous irrigation ditches, some of which are parts of large systems that bring water from considerable distances, but most of which distribute water to areas here under cultivation.

Le Grand. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of part of the considerably dissected westward-sloping plain of the Great Valley of California near its junction with the hills. No perennial streams occur in the area, but several well-opened valleys, such as that of Chowchilla River, show the course followed by the run-off of torrential rains.

Lingard. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of part of the practically undiversified westward-sloping plain of the Great Valley of California south of Merced. All the streams in the area are intermittent.

Little Table Mountain. Scale, 1 inch=½ mile; contour interval, 5 feet. (Part of quadrangle.)

Large-scale map of area a short distance east of the Great Valley of California, cut up into innumerable small knolls and a few higher knobs, such as Little Table Mountain, which rises abruptly 500 feet above the adjacent country.

Mount Whitney. Scale, 1 inch=2 miles; contour interval, 100 feet.

Map of a part of the Sierra Nevada, showing its glaciated aspect, troughlike valleys, abundant lakes, steep slopes, and sharp peaks, the highest of which, Mount Whitney, rises to 14,501 feet; also its abrupt descent toward the east to the gently sloping, nearly flat Owens Valley, which is bounded on the east by the rugged Inyo Mountains, which rise to elevations of over 10,000 feet.

New Almaden. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of part of the Santa Cruz Mountains, whose peaks rise to elevations of 3,000 feet and whose rocks contain some of the richest quicksilver deposits in this country. The crookedness of many of the roads that lead up the mountain slopes indicates the steepness of the ridges, whose crests, however, are followed for considerable distances by the secondary roads and trails.

Orestimba Creek. Scale, 1 inch=½ mile; contour interval, 5 feet. (Part of quadrangle.)

Map of a much cut-up hilly region forming part of the western boundary of the Great Valley of California. A fairly large valley trends eastward across the mapped area, but neither the stream in it nor the streams in any of the other valleys shown are perennial.

Owens Creek. Scale, 1 inch=½ mile; contour interval, 5 feet. (Part of quadrangle.)

Map of part of the hilly country east of Merced, showing its passage into the dissected plain which forms the eastern margin of the Great Valley of California. No perennial streams occur in the area, though well-marked valleys, spaced at intervals of 5 or 6 miles, trend southwestward from the hills.

Piedras Blancas. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of a small part of the coast region of California, whose shore line is irregular, with numerous rocky stacks lying just offshore. Back from the shore the country rises to a well-marked terrace at an elevation of about 500 feet, to the east of which rise hills whose summits are more than 2,500 feet above the sea.

Plainsberg. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of part of a nearly featureless plain that slopes in general westward at the rate of less than 4 feet to the mile toward San Joaquin River in the southern part of the Great Valley of California. The absence of obstruction to travel on this plain is indicated by the course of the Southern Pacific Railroad, which runs in a perfectly straight line diagonally across the area.

Point Reyes. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of part of the coast of California north of the entrance to San Francisco Bay. The area shows a great diversity of coast and mountain forms, which makes the map of the region almost indispensable to teachers. The contrast between the rugged shore of Point Reyes and the smooth, eroded shore fronting the Pacific north of that point, the drowned valleys north of Drake Bay, and the sand beaches

and nipped headlands affords graphic illustrations of some of the various products of marine action. Tomales Bay, a peculiar fiord whose position is probably determined by a line of earth movement, or fault, illustrates lesser erosion due to a smaller body of water.

Point Sur. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the coast of California south of Monterey. The mountains of the Santa Lucia Range rise abruptly from the sea in rocky cliffs, and innumerable rocks and islets in the ocean fringe the shore, which is ragged and irregular, showing few beaches or bay-head fillings except in the immediate vicinity of Point Sur, which is apparently a land-tied island.

Powell Slough. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of the city of Colusa, on Sacramento River, and the practically flat and undiversified plain to the west. Except Sacramento River, there are no continuous streams in the region, but the four or five bodies of water forming Powell and Hopkins sloughs, which apparently occupy an old line of drainage, are noteworthy features.

San Benito. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of the mountainous country 35 to 50 miles east of Monterey, whose highest peaks rise to nearly 4,000 feet but whose topography does not show any decided trend due to marked differences in the characters of the underlying rocks. Throughout the area practically all the streams are intermittent.

San Luis Ranch. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map, on large scale, of part of the Great Valley of California where it is traversed by San Joaquin River and its network of sloughs, in which are numerous artificial embankments, some carrying irrigation ditches.

San Miguel. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of a part of Salinas River and the dissected plateau region to the north and east of it, which rises to elevations of about 2,700 feet in the Cholame Hills and Middle Mountain. The map indicates that no perennial streams except the main river occur in the area.

Sandy Mush. Scale, 1 inch=½ mile; contour interval, 5 feet.

Large-scale map of an exceptionally flat part of the plain of the Great Valley of California, east of San Joaquin River, with well-marked natural levees indicated along the streams.

Snelling. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of part of Merced River that flows on a broad-floored valley, the topography of which indicates several abandoned courses of this stream, and the rolling hills north of the river. The broad floor of part of Dry Creek valley is a noteworthy feature of the area, as are also the three short stretches of this stream, which are the only parts that carry water throughout the year.

Spring Valley. Scale, 1 inch=½ mile; contour interval, 5 feet. (Part of quadrangle.)

Map of part of plain sloping gently northeastward from the hills west of Clear Lake. Notable features are the present eastward course of Cortina Creek, its old nearly northerly course, and a probably still older course toward the northeast, which is now marked only by its abandoned natural levees.

Suisun. Scale, 1 inch=½ mile; contour interval, 5 and 10 feet.

Map, on large scale, of the marshy area adjacent to Montezuma Creek and its numerous sloughs, a broad plain sloping gently southward, from the northern margin of which rise, like islands, Vaca Mountain and two isolated highlands, one rising above the marshy lowland and the other above the southern margin of the plain.

Turner Ranch. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of part of San Joaquin River and the nearly flat plain to the north through which it flows. The country for 3 or 4 miles south of the main channel of the river is a practically untraversable network of sloughs. Several good examples of interrupted streams may be seen in the area north of the river.

Colorado.

Rocky Mountain National Park. Scale, 1 inch=2 miles; contour interval, 100 feet.

Map of part of the Rocky Mountains, here forming the Continental Divide, the highest of whose peaks is Long Peak, 14,255 feet, though many others rise to elevations of more than 13,000 feet; the whole showing the topography usual in lofty mountains, such as glaciers, glaciated valleys, lakes, precipitous slopes, and great relative relief.

Delaware.

Cape Henlopen. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of Delaware Bay, the Atlantic Ocean, and the coastal region in the vicinity of Cape Henlopen, the highest point in the area being the sandy ridge, 70 feet high, on which Cape Henlopen light is built. The depth of water is indicated by blue contours for 5, 10, and 20 feet.

Cedar Creek. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of Delaware Bay and the gently sloping plain west of it, whose highest parts rise to elevations of only about 50 feet, and whose coastal part, except the narrow sandy strip along the bay, is a marsh.

Harrington. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of nearly level plain adjacent to the Delaware-Maryland boundary, most of which stands only about 60 feet above the sea but nearly all of which is flat, so that roads traverse it in all directions. (Partly in Maryland.)

Rehoboth. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the coast of Delaware, the conspicuous topographic features of which are the long sand reefs, which have cut off Rehoboth and Indian River bays from the ocean, except at very narrow inlet. The country back from the coast is a low plain, and the lower parts of the courses of the rivers appear to have been submerged.

Florida.

Boulogne. See Georgia.

Cambon. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the Atlantic Coastal Plain in Florida, with numerous swamps and practically no definite streams, showing in the eastern part a plain whose upland stands at an elevation of about 20 feet, which is separated by a fairly distinct low escarpment from a higher plain, whose upland rises in places to an elevation of 100 feet.

Fernandina. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the coast of Florida and Georgia, showing sandy reefs, inland from which are salt-water marshes traversed by a network of sloughs and rivers, the largest of which, St. Marys River, has been made accessible to vessels drawing as much as 20 feet of water, by jetties 2 and 3 miles long built out into the ocean.

Folkston. See Georgia.

Hilliard. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of the low swampy plain in the extreme northern part of Florida, none of which is as much as 100 feet above the sea and all of the eastern part of which is below 50 feet. In the region there are almost no surface streams, but swamps occupy every swale and are abundant even on the uplands.

Jacksonville. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of Jacksonville, which has been built on the plain adjacent to St. Johns River and is the center from which many railroads radiate. The country around the city is a low plain, in few places as much as 50 feet above the sea. A noteworthy exception is a small area between Cedar Creek and Turner Ponds, where there are knobs that rise to heights above 100 feet.

Kingsland. See Georgia.

Mayport. Scale, 1 inch=1 mile; contour interval, 5 feet.

Map of part of the coast in northern Florida, at the mouth of St. Johns River, with projecting jetties, seaside settlements that dot the coast, and the swamp and low plains traversed by an intricate network of sloughs and channels.

Middleburg. Scale, 1 inch=1 mile; contour interval, 10 feet. (Photolithograph.)

Map of part of the Coastal Plain in northern Florida, which throughout much of its area is about 80 feet high but whose highest points stand at elevations of about 150 feet. In the northern part of the area mapped swamps are numerous, but in the southern and southwestern parts the uplands are well drained.

Moniac. See Georgia.

Orange Park. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of estuary-like part of St. Johns River and the swampy plain through which it flows, none of which is as much as 80 feet in elevation and most of which is under 25 feet. The depths in the ocean are shown by contours for 5, 10, and 20 feet below mean low water.

Palm Valley. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the coast of Florida, with nearly straight shore, well-marked beach ridge, marshy plain, and a few uplands that are as much as 60 feet above the sea. The courses of Guano River, parallel to the shore and not more than half a mile distant, and of North River, about 1½ miles from the shore, are noteworthy.

St. Marys. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of Nassau and St. Marys rivers and the low plain between them. The rivers flow in broad, swampy lowlands, in which they straggle in irregular bends and curves and above which the highest part of the flats, forming most of the uplands, rises only 20 to 30 feet. (Partly in Georgia.)

Georgia.

Boulogne. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the low plain traversed by Satilla and St. Marys rivers, mostly swamp with intervening higher areas, the highest uplands apparently forming a dissected plain that stands at an elevation of 70 to 100 feet and a lower plain at 20 to 30 feet. (Partly in Florida.)

Camp Gordon. Scale, 1 inch=2 miles; contour interval, 5 feet.

Map formed by combining on one sheet the Atlanta map and part of the Marietta map. Shows the country around Camp Gordon. A text prepared by F. E. Matthes, printed on the back of the map, gives, in popular style, a description of the more conspicuous natural features of the region.

Cumberland Island. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of a part of the coast of Georgia, showing an offshore sandy reef, behind which are salt-water marshes, traversed by a network of channels and sloughs. Sand dunes dot the reef at irregular intervals. The depth of the water off the coast is indicated by under-water contours for 5, 10, and 20 feet.

Everett City. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the low plain, much of it swampy, through which Altamaha River flows in a broad-floored valley. The surface of the plain in the eastern part of the area stands at an elevation of less than 20 feet, but the upland in the western part is about 50 feet in elevation and is separated from the lower plain by an easily recognized escarpment.

Folkston. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of Okefenokee Swamp and its eastern boundary, Trail Ridge, whose crest, about half a mile wide, rises 20 to 30 feet above the swamp and whose eastern slope descends rather steeply until it joins a plain whose surface stands 50 to 60 feet below the crest of the ridge. (Partly in Florida.)

Gough. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the rolling dissected plateau near the western margin of the Coastal Plain province, whose upland surface stands at an elevation of somewhat less than 400 feet above the sea and whose streams are in rather narrow-floored valleys, few of which are utilized for roads.

Hinesville. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of swampy lowland 25 to 40 miles west of Savannah, through the northern part of which flows Canoochee River. Plains at two distinct elevations, 20 feet and 85 feet, separated by a well-marked escarpment, are clearly recognizable.

Hortense. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the swampy plain of southern Georgia, 15 to 25 miles west of the ocean. Satilla River flows through the southern part of the area, but elsewhere the plentiful rainfall is absorbed by the swamps and from them fed to the larger rivers without forming distinct surface streams.

Jesup. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of Altamaha River, the broad swamps through which it flows, and the dissected plain which lies southwest of it and which, through much of the area, is separated from the flood plain of the river by a steep cliff 50 to 75 feet high. Flat uplands stand at different elevations and in places are separated by moderately steep escarpments.

Kingsland. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the low swampy plain of Georgia a few miles west of the ocean, most of it less than 25 feet above the sea and a large part of it a marsh, practically at sea level, through which sloughs and the drowned lower courses of some of the rivers form an untraversable network. (Partly in Florida.)

Moniac. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of the eastern part of Okefenokee Swamp and its eastern boundary, Trail Ridge, whose crest rises 20 to 40 feet above the swamp and descends rather steeply eastward to a lower plain. The continuation of these features to the north is shown in the Folkston quadrangle. St. Marys River, which marks the boundary between Georgia and Florida, traverses the lower plain in a rather wide-floored trench. (Partly in Florida.)

Nahunta. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the plain of eastern Georgia traversed by Satilla River, which flows in a winding course through a broad, swampy lowland that is practically untraversable by roads. East and west of the lowland rather steep slopes lead to the upland, whose nearly flat surface stands about 50 feet above the level of the river.

Pineland. See South Carolina.

St. Marys. See Florida.

Shirley. See South Carolina.

Idaho.

Paradise Valley. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the Blackfoot Mountains, southwest of which is Paradise Valley, a level lowland about 2 miles wide, which stands 600 feet above the main stream, Blackfoot River, one of whose tributaries, Brush Creek, has eroded a deep canyon and thus appears to have diverted the drainage of the valley. Numerous terraces occur along Blackfoot River.

Preston. Scale, 1 inch=2 miles; contour interval, 10 feet.

Map of part of the Bear River and Wasatch ranges, whose highest peaks rise to elevations of more than 9,000 feet and whose dissected western foothills fall away westward to Cache Valley. In its northern part Bear River, the main stream of the area, flows in a well-opened valley, but farther south it traverses the foothills in the canyon, the narrowest part of which is called Oneida Canyon, from which it flows through the open lowland of Cache Valley in a fairly broad-floored trench. (Partly in Utah.)

Illinois.

Altenburg. Scale, 1 inch=1 mile; contour interval, 20 feet. (Part of quadrangle.)

Map of part of Mississippi River, its flood plain to the north, and the rocky point, Fountain Bluff, against which the river impinges.

Campbell Hill. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of a part of Mississippi River and its flood plain, whose surface is marked by former channels of the river, now filled with silt, and of rather thoroughly dissected uplands whose tops stand about 700 feet above sea level or 350 feet above the river. (Partly in Missouri.)

Camp Grant. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map formed by combining maps of parts of the Kings, Kirkland, Rockford, and Belvidere quadrangles to show the region around Camp Grant. A text written in popular style, printed on the back of the map, gives an account of the origin and appearance of the more conspicuous natural features.

Dixon. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of dissected plains of central Illinois west of Chicago, traversed by Rock River, which has cut the floor of its valley about 100 feet below the summit of the adjacent upland and has formed, in parts of its course, flood plains that are half a mile wide. In the stream are many islands, so that in places it has a distinctly "braided" appearance. Abandoned courses of the river are distinctly seen southwest and northwest of Grand Detour.

Good Hope. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the eastward-sloping dissected plains or low plateaus of west-central Illinois. In places the plain has been cut rather deeply by streams, such as Crooked Creek and its tributaries and Swan Creek and its tributaries.

La Harpe. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the plain of west-central Illinois, which is dissected by numerous westward-flowing streams, between which is the nearly flat plain of the uplands. The map furnishes an especially good example of the youthful stage in the dissection of a nearly featureless plain.

Morris. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of Illinois River and the nearly smooth plain through which it flows in east-central Illinois. The greatest relief, which is about 180 feet, is between Illinois River 4 miles west of Morris and a point north of Lisbon, in the extreme northwestern part of the area.

Vermont. Scale, 1 inch=1 mile; contour interval, 20 feet. (Part of quadrangle.)

Map of a strip of country, about 3 miles wide east and west and 15 miles long north and south, in the west-central part of Illinois, which is mostly a plain, slightly cut in the southern part by a small stream, Sugar Creek, and its tributaries.

Vienna. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the extreme southern part of Illinois, which is a dissected plateau with irregularly arranged valleys, the most notable of which is the lowland, 2 or 3 miles wide, that is followed in part by Cache River and the New Columbia, Bear Creek, and San Beck ditches—a lowland which marks the abandoned course of a large river.

Wilmington. Scale, 1 inch=1 mile; contour interval, 20 feet. (Resurvey.)

Map of part of the plain southwest of Chicago, which is traversed by Kankakee and Des Plaines rivers. The maximum relative relief is less than 200 feet, and much of the area is less than half this height above the main streams.

Indiana.

Winchester. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the little-dissected plain of west-central Ohio and east-central Indiana, the relief of whose surface is so slight that settlements, railroads, and roads are located with no hindrance from the topographic features. (Partly in Ohio.)

Iowa.

Camp Dodge. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map formed by printing on one sheet parts of the maps of the Madrid, Slater, Waukee, and Des Moines quadrangles to show the region around Camp Dodge. A text prepared by J. H. Lees and W. C. Alden, printed on the back of the map, gives an account of the origin and appearance of the more conspicuous natural features of the region.

Chariton. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of the dissected plateau or plain of south-central Iowa, whose former flat upland surface has been largely destroyed by numerous streams, which have cut rather steep-sided, narrow-floored valleys, though the largest stream, White Breast Creek, flows in irregular small bends on a floor that is much wider than the belt of country between the bends.

Kansas.

Columbus. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the plains in the extreme southeast corner of Kansas, not far from the well-known lead and zinc districts of Missouri and Oklahoma. Several isolated knobs, such as Blue Mound, rise to elevations between 950 and 1,000 feet and suggest that they are remnants of a once much more extensive surface which stood at that elevation.

Kentucky.

Camp Taylor. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map formed by combining and printing on one sheet maps of the Prospect, Kosmosdale, and Louisville quadrangles to show the region around Camp Taylor. A text prepared by Charles Butts, printed on the back of the map, gives an account of the origin and appearance of the more conspicuous natural features of the region.

Harlan. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of a much-dissected northwestward-sloping plateau formed of southeastward-dipping rocks. Pine Mountain, trending eastward, traverses the central part of the area and is an unsymmetrical ridge, bounded on the north by a fault that together with a belt of soluble rocks has determined the position of the lowland occupied by Straight Creek, the head of Beach Fork, and the headwater branches of Laurel Fork.

Hyden. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the dissected plateau of southeastern Kentucky, which is characterized by highlands that rise to approximately the same elevation and in which there is very little flat land, either along the streams or on the tops of the ridges. By a misapplication of names the largest branch of the Middle Fork of Kentucky River above the forks is called Greasy Creek, whereas a much smaller branch carries the name "Middle Fork."

Williamson. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of the dissected plateau in the eastern part of Kentucky, where the largest stream is Tug Fork, which forms the boundary between Kentucky and West Virginia. The roads and trails follow the streams or pass from one valley to another through gaps at the heads of stream basins that lie on opposite sides of the ridges. (Partly in West Virginia.)

Maine.

Cutler. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map showing part of the coast of Maine and a few islands, such as Machias Seal Island and North Rock, that lie 10 miles offshore. The depth of water up to and including 20 feet is indicated by contours drawn 5, 10, and 20 feet below sea level. The coast line is irregular but not deeply fiorded, and the country back from the coast is hilly and includes a poorly drained swampy area, the whole owing much of its appearance to glaciation.

Machias. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the coast of Maine. The outline of the shore is irregular, as it is cut by numerous bays. A great number of islands lie offshore, and irregularly distributed knobby hills and low tracts form the inland region.

Maryland.

Harrington. See Delaware.

Massachusetts.

Camp Devens. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map formed by combining parts of maps of the Groton, Fitchburg, Lowell, Worcester, Marlboro, and Framingham quadrangles to show the region adjacent to Camp Devens. A text prepared by W. W. Atwood, printed on the back of the map, gives an account of the origin and appearance of the more conspicuous natural features of the region.

Michigan.

Bay City. Scale, 1 inch=1 mile; contour interval, 5 feet.

Map of part of Saginaw Bay and the country southwest of it, a plain only 15 to 20 feet above the lake, which is traversed by Saginaw River, on both sides of which Bay City has been built. Parallel to the shore are several linear ridges whose form and position suggest that they are old beach ridges and moraines. The highest and most continuous of these ridges is followed for a long distance by the Ausable State road.

Camp Custer. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map formed by combining parts of the maps of the Galesburg and Battle Creek quadrangles to show the region adjacent to Camp Custer. A text prepared by Frank Leverett, printed on the back of the map, gives an account of the origin and appearance of the more conspicuous natural features of the region.

Cedar Springs. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of the glaciated plains north of Grand Rapids, in the southern part of which Grand River flows on a valley floor that appears too wide for the present stream. The upland is dotted with small knobs and depressions that mark deposits or sculpturing produced by the glaciers that once occupied the region.

Elsie. Scale, 1 inch=1 mile; contour interval 5 feet.

Map of part of the plain of central Michigan which was overridden by the ice of the continental glacier that covered the northern part of the United States in the distant past and left evidence of its occupation in the form of the hills and valleys and the material that covers them and in the courses of the streams.

Ionia. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of the nearly flat plain of south-central Michigan, traversed by Grand River, which flows in a sinuous course on the flat floor of a trench, three-quarters of a mile wide, sunk 100 to 150 feet below the surface of the upland. The great width of the valley indicates that it was once occupied by a much larger stream.

Kalamazoo. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the plains country of southern Michigan, whose surface is much diversified by small knobs and depressions formed by the irregular deposition of material through the action of great glaciers that once occupied the region.

Lowell. Scale, 1 inch=1 mile; contour interval, 20 feet..

Map of part of the glaciated plain of west-central Michigan, which is traversed by Grand River and its tributaries. Grand River flows on the floor of a trench cut below the general level of the uplands. The floor of the trench is nearly flat and about half a mile wide, and the course of the trench is much less sinuous and irregular than the course of the river.

Mount Pleasant. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of the typical portion of the central part of the Lower Peninsula of Michigan, which is characterized by irregularly distributed knobs, ridges, and depressions that owe their present aspect largely to the continental glacier that covered the region in the past.

Perrinton. Scale, 1 inch=1 mile; contour interval, 5 feet.

Map of part of the glaciated plain of central Michigan, whose topography shows numerous features, such as moraines and disorganized drainage, that are the results of the former occupation of the region by great glaciers. The abrupt change of the course of Hayworth Creek, whereby that stream abandons a well-marked valley that lies directly in line with its general course, indicates the complexity of the history of the events that produced the present features.

Saginaw. Scale, 1 inch=1 mile; contour interval, 5 feet.

Map of the plain at the head of Saginaw Bay on which the city of Saginaw has been built. Although this plain is somewhat cut by numerous small streams and Saginaw River, roads and railroads traverse it in all directions without encountering topographic obstructions.

Minnesota.

Beardsley. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of portion of Lake Traverse which is in a depression marking an old glacial drainage line through the adjacent glaciated plains, whose otherwise nearly flat surface is interrupted by numerous hollows, some of which contain lakes that differ from one another in size and shape. (Partly in South Dakota.)

Peever. See South Dakota.

Pillager. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of a region of innumerable lakes of divers shapes and sizes, interspersed with small isolated hills and here and there an area of somewhat higher country formed of a confused jumble of knobs and depressions. Some of the lakes are so large that such shore features as spits, land-tied islands, and cliffs have been formed around their margins. The aspect of the region is in large measure attributable to glaciation in the past.

Missouri.

Campbell Hill. See Illinois.

Halltown. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the dissected upland which forms the divide between the drainage basins of Missouri, Arkansas, and White rivers. In the eastern part of the region depressions, probably sink holes, are numerous on the upland

Montana.

Heart Butte. Scale, 1 inch=1 mile; contour interval, 100 feet.

Map of part of the mountains that form the Continental Divide, which abruptly drop off toward the east, so that within 10 miles they merge into plains that slope gently northeastward. On the plain near the foot of the mountains are innumerable small lakes.

Porcupine Valley. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of dissected plateau north of Missouri River in northeastern Montana, whose general upland elevation is about 2,700 feet. Porcupine Creek and its tributaries have cut valleys 400 to 500 feet below the level of the upland. A noteworthy feature of the area is the valley of East Fork, which can be traced for at least 10 miles and is practically as deep and as large as the valley of the main stream, though no perennial stream flows in it.

Nevada.

Goodsprings. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of Spring Mountain and adjacent ridges, in several of which are valuable mineral deposits, which are now being mined. The mountains rise to elevations of 5,000 to 8,000 feet. Their higher parts are steep and rugged, but their lower slopes are gently inclined plains of outwash material. (Partly in California.)

Highland. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of the Highland Range and adjacent country in east-central Nevada. The mountains, whose highest peak has an elevation of nearly 9,400 feet, trend nearly north and south, and from their bases, starting at elevations of about 6,000 feet, plains slope east and west. The minuteness of the dissection of these plains near the mountains is noteworthy. The few intermittent streams in the area wither away on the sloping plains.

New Hampshire.

Alton. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of rolling country above the general level of which stand higher hills, such as the Blue Hill Range and Birch Ridge, and which is diversified by a number of lakes and swampy areas that probably mark filled-in lakes, the whole region having been subjected to glaciation.

New Jersey.

Camp Dix. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of the region adjacent to Camp Dix, which lies some 15 miles southeast of Trenton, N. J., on the Coastal Plain, which at the camp is about 120 to 175 feet above the sea, but whose relatively smooth surface is interrupted at several places outside the camp by higher knobs and tracts, such as the Stony Hills, which rise to elevations of more than 300 feet. (Partly in Pennsylvania.)

New Mexico.

Antelope Wells. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of part of an area immediately north of the Mexican border. In the easternmost part is the flat plain of Playas Valley, west of which are broken mountains and rolling dissected hills that trend in general northwest.

Big Hatchet Peak. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of the Big Hatchet Mountains, whose highest peak has an elevation of about 8,366 feet and whose rugged slopes give way at an elevation of about 4,700 feet to gentler ones, which on the southwest extend to Playas Valley and on the northeast abut on a plain of similar origin and form, sloping southwestward from the Sierra Rica.

Chiricahua. See Arizona.

Cienega Springs. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of a strip of country lying about 12 miles north of the Mexican boundary, the most prominent feature of which is Animas Valley, a lowland 8 to 10 miles wide from east to west, which lies between the Animas and San Luis mountains on the east and the Guadalupe and Peloncillo mountains on the west, a large part of these four ranges being shown on the map.

Dog Mountains. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of the Alamo Hueco Mountains and the near-by groups of isolated hills, like the Dog Mountains, which rise abruptly from the outward-sloping plains that encircle the highlands and have probably been formed in large part by outwash from the mountains.

Hachita. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of part of Hachita Valley, a broad, open north-south lowland formed of gently sloping outwash plains from the mountains to the east and west. The mountains to the west, the Little Hatchet Mountains, fall largely within the area mapped, but only isolated spurs of the mountains to the east, such as the Apache Hills and Sierra Rica, lie within the area.

Pelona. Scale, 1 inch=2 miles; contour interval, 100 feet.

Map of the mountains forming part of the Continental Divide in west-central New Mexico and the plains of San Agustin, an intermontane lowland whose surface is exceptionally flat and undissected, an area of more than 65 square miles having no relief sufficient to be shown on the map by a contour line.

Perilla. See Arizona.

Playas. Scale, 1 inch=1 mile; contour interval, 25 feet.

A splendid representation of a part of the desert country in which two mountain groups, trending north and south, whose crests are about 15 miles apart, are separated by a lowland formed by plains that slope eastward and westward from each group. The depression where these two gentle slopes meet is occupied during rainy seasons by Playas Lake, a body of water more than 12 miles long and in most places less than a mile wide.

Victorio. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of the rugged Cedar Mountain Range, in the southwestern part of New Mexico, the highest peaks of which stand over 6,000 feet above the sea and whose less steep lower slopes gradually merge into the sloping plain that, with a similar but northward-sloping plain from the mountain to the south and west, forms the lowland traversed by the El Paso & Southwestern Railroad.

Walnut Wells. Scale, 1 inch=1 mile; contour interval 25 feet. (Photolithograph.)

Map of part of the Animas Range and the plain that slopes eastward from its base, which forms the western part of Playas Valley. No perennial streams occur in the region. The map shows a splendid example of a dissected mountain range in a dry climate.

New York.

Camp Mills. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map formed by combining parts of the maps of the Oyster Bay and Hempstead quadrangles to show the region adjacent to Camp Mills. A text prepared by W. C. Alden, printed on the back of the map, gives an account of the origin and appearance of the more conspicuous natural features of the region.

Hornell. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of a rolling upland whose slopes have been in large measure smoothed by glaciation but whose most conspicuous physiographic feature is the disarranged drainage, whereby the broad lowland in part occupied by Canisteo River has been abandoned by a former stream and the extreme northern part of the area has been cut into by Canaseraga Creek, which drains northward, its continuation being shown on the map of the Wayland quadrangle.

Oswegatchie. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of the rolling hilly country west of the highest part of the Adirondack Mountains, which is studded with a number of lakes and whose streams, tributary to the St. Lawrence, flow in irregular courses, here through marshy tracts, there through narrow gorges, and still elsewhere in moderately opened-out valleys, these features all being due in large measure to the former glacial occupation of the region.

Unadilla. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the highland region in south-central New York, through which flows Susquehanna River and its good-sized tributary from the north, Unadilla River. The smoothness of the uplands and the modification of the form of some of the valleys are due to glaciation.

Ohio.

Camp Sherman. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of the region adjacent to Camp Sherman, a description of whose geographic features, by M. R. Campbell, illustrated by pictures and diagrams, is printed on the reverse side.

College Corner. Scale, 1 inch=1 mile; contour interval, 20 feet. (Part of quadrangle.)

Map of part of the slightly dissected low plateau or plain of west-central Ohio, large areas of which are flat uplands that stand at an elevation of about 1,000 feet above sea level, or about 100 feet above the larger streams.

Felicity. Scale, 1 inch=1 mile; contour interval, 20 feet. (Part of quadrangle.)

Map of part of Ohio River, the narrow strip of flood plain and terrace that borders its course, and the dissected plain or plateau whose surface stands at an elevation of about 900 feet, in which the river has cut down its bed in a steep-sided trench.

Fort Recovery. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of a strip of country about 3 miles wide, immediately east of the Indiana boundary, in west-central Ohio. The area seems to show plains at several different elevations, the highest at about 1,120 feet and the lowest at about 900 feet. The relief, however, is nowhere great.

Kelleys Island. Scale, 1 inch=1 mile; contour interval, 10 feet.

The larger part of the map represents Lake Erie, in which Kelleys Island, a tract only 3 miles long from east to west and less than 3 miles wide from north to south, rises to a height of 40 feet. The island, like the adjacent mainland, is important commercially because of its lime industry.

Lawrenceburg. Scale, 1 inch=1 mile; contour interval, 20 feet. (Part of quadrangle.)

Map of a small strip of Hamilton County about 10 miles long north and south by 4 miles wide, 15 miles west of Cincinnati, in the extreme southwestern part part of Ohio. In this area is the junction of Miami and Ohio rivers, the Miami and its tributary, Whitewater River, flowing in broad-floored valleys, although the Ohio, the larger stream, flows in a valley that has a narrow floor.

Maysville. See Springdale.

New Paris. Scale, 1 inch=1 mile; contour interval, 20 feet. (Part of quadrangle.)

Map of a strip about 3½ miles wide, immediately adjacent to Indiana in west-central Ohio. The area is a plain or plateau somewhat dissected by East Fork, Whitewater River, and the other creeks tributary to streams flowing into Ohio River.

Peebles. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of a dissected plateau of south-central Ohio, which has been so thoroughly intersected by streams that only here and there is the upland flat-topped, but

instead it is generally rolling and the slopes from it to the streams are steep. The largest streams in the region are Ohio Brush Creek, which flows directly southward to the Ohio, and South Scioto Creek, which flows eastward to Scioto River.

Seaman. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the dissected plain or plateau just north of Ohio River in the southwestern part of the State. In the southern part of the area the great amount of dissection has left but little of the original flat-topped upland, but farther north these flats become more continuous and larger.

Springdale and Maysville. Scale, 1 inch=1 mile; contour interval, 20 feet. (Parts of the quadrangles.)

Map of part of the dissected plateau in southern Ohio just north of Ohio River, which is bordered by a steep slope that rises from the narrow flood plain to a height of about 400 feet above the river. Some of the terraces, which stand 20 to 60 feet above the river, have been selected as sites for settlements. Manchester, the largest town in the area mapped, has been built on two of these terraces.

Vanceburg. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of Ohio River and of the dissected plateau to the north. The floor of the valley of the river is here and there opened out so as to form flats, a mile or less wide. From these flats steep slopes lead to the summit of the plateau, which, though much cut up by streams, includes small areas that are relatively flat.

Winchester. See Indiana.

Oregon.

Kerby. Scale, 1 inch=1 mile; contour interval, 100 feet.

Map of part of southwestern Oregon just north of the California boundary, showing a dissected mountain mass, some of whose crests rise to elevations of 5,000 feet. In its upper or southeastern part Illinois River, the main stream in the area, flows through a broad-floored valley, but farther north and west it flows in a canyon that is too narrow to afford space even for a trail.

Troutdale. Scale, 1 inch=1 mile; contour interval, 25 feet. (Part of quadrangle.)

Map of part of Columbia River at its junction with Sandy River, about 25 miles east of Portland, and the country to the south. Flat areas at different elevations indicate terraces formed at earlier stages in the topographic development of the region.

Pennsylvania.

Camp Dix. See New Jersey.

Newville. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of South Mountain, the Blue Ridge, and the broad rolling lowland between them, the whole presenting a diversified topography, which has been developed by erosion acting for different lengths of time and on rocks of diverse hardness.

South Carolina.

Allendale. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of a portion of the dissected plain whose upland surface stands about 250 feet above the sea and whose streams flow through marshy-floored valleys so swampy that few roads follow them, most of the roads running along the crest of the upland.

Bulls Island. Scale, 1 inch=$\frac{1}{3}$ mile; contour interval, 5 feet.

One of a group of maps (Bulls Island, Capers Island, James Island, Kiawah Island, Ladson, Legareville, Melgrove, Sewee Bay, and Wando) on a large scale (1: 21,120), which show some of the coastal country adjacent to Charleston. Little of the region is as much as 40 feet above the sea, and much of it is swampy land practically at sea level, sparsely inhabited except in the

immediate neighborhood of Charleston, which owes its position to the good harbor afforded by the drowned lower courses of Cooper, Wando, and Ashley rivers.

Capers Island. See Bulls Island.

Cottageville. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the Coastal Plain more than half of whose surface is a swamp. A good-sized stream, Edisto River, crosses the center of the quadrangle from north to south, but it receives practically no tributaries in this entire distance, though probably much water is fed into it by seepage from the bordering swamps.

Cummings. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of a part of the Atlantic Coastal Plain whose highest point is only 100 feet above the sea. Salkehatchie River, which with its tributaries flows through the central part of the area, is the main stream in a marshy wide-floored valley that is avoided by roads. Much of the area is poorly drained and swampy.

Edisto Island. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the smooth coast line, the entrance to South Edisto River, and the swampy lowland country adjacent to that stream. No point in the southern two-thirds of the area mapped is as much as 20 feet above the sea, and no place shown on the map reaches 50 feet.

Green Pond. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of an area in southeastern South Carolina near the coast. In the southern part of the area are Coosaw River and its innumerable sloughs, tributaries, and marshes. The region farther north is a marshy plain, in few places more than 30 feet high, through which Combahee, Chehaw, and Ashepoo rivers flow in meandering courses.

James Island. See Bulls Island.

Kiawah Island. See Bulls Island.

Ladson. See Bulls Island.

Legareville. See Bulls Island.

Melgrove. See Bulls Island.

Olar. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the plain whose rather slightly dissected upland rises to an elevation of about 160 feet above the sea and whose largest stream flows in a trench about 50 feet below the upland, the floor of which is much wider than the stream and is so swampy that no roads follow it.

Pineland. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of a part of the plain northeast of Savannah River, which contains numerous swamps, from some of which streams issue, and nearly flat upland areas, on which roads run and most of which rise not more than 100 feet above sea level. (Partly in Georgia.)

Sewee Bay. See Bulls Island.

Shirley. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of a portion of Savannah River which flows in irregular bends through a swampy valley floor about 2 miles wide that is bordered on the east by a low plain and on the west by rather steep bluffs, 50 feet or more high, which lead to an upland plain that stands at an elevation of 120 to 140 feet above the sea, or 90 to 100 feet above the river. (Partly in Georgia.)

Varnville. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of the dissected swampy plain of eastern South Carolina, the highest parts of which stand only 150 feet above the sea and the lower parts about 30 feet. The relative relief throughout most of the area is very much less than the difference between these two amounts. The larger streams flow in wide-floored valleys, which are so swampy that the roads cut across them by routes as short as possible.

Walterboro. Scale, 1 inch=1 mile; contour interval, 10 feet. (Photolithograph.)

Map of part of the dissected swampy plain of eastern South Carolina. In the eastern part of the area few of the summits of the upland are as much as 50 feet above sea level. In the western part, however, many of the summits stand at an elevation of 100 feet. Some of the swamps drain in two or more directions.

Wando. See Bulls Island.

Yemassee. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of plain in the southeastern part of South Carolina, consisting of almost equal areas of low, marshy swamps, through which the rivers flow, and better-drained areas that stand 50 to 100 feet above the swamps and are usually separated from them by abrupt though low slopes.

South Dakota.

Beardsley. See Minnesota.

Peever. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of Lake Traverse, Big Stone Lake, and the narrow lowland between them, which together form a depression, marking an old drainage line, in the adjacent glaciated plains, whose nearly flat surface is interrupted by numerous hollows of irregular shape and of varying sizes. The northeastward continuation of Lake Traverse is shown on the map of the Beardsley quadrangle. (Partly in Minnesota.)

Texas.

Addicks. Scale, 1 inch=½ mile; contour interval, 1 foot.

Map of part of the sloping plain between Houston and Brazos River, which is somewhat dissected and which, because of the small contour interval used, appears to be less smooth than it actually is, for the difference in elevation in the entire area mapped is only about 60 feet.

Bone Spring. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the Rosillos and Santiago mountains and the desert basins that extend from their bases, whose main topographic features are determined by the kind and structure of the underlying rocks and their erosion and the deposition of the eroded material, but whose detailed features—for example, the drainage of Dagger Flat and Persimmon Gap—indicate a complex and interesting history.

Bullis Gap. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the dissected plateau lying north of the Rio Grande, whose surface slopes eastward from an elevation of somewhat more than 3,000 feet in its western part to about 2,500 feet in its eastern part and the dissection of which has produced ridges, mesas, and buttes.

Cypress. Scale, 1 inch=½ mile; contour interval, 1 foot.

Map of plains in the vicinity of Houston, all of whose surface, except the extreme northwestern part, lies between 118 and 155 feet above the sea. Like other parts of this same general region, the area shows a great number of small, shallow depressions, some of which contain ponds.

Deepwater. Scale, 1 inch=½ mile; contour interval, 1 foot.

Map of a plain whose highest part is less than 50 feet above the sea and is trenched across and somewhat dissected by Buffalo Bayou and its tributaries. On the surface of the plain are numerous irregularly distributed small depressions. The small contour interval adopted makes the streams, as mapped, appear to flow in deep canyons, though in reality few of the valleys are as much as 35 feet deep.

Dove Mountain. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of the much-dissected plateau of southwestern Texas, among the noteworthy special topographic features of which are the crescentic range of hills in the northeastern part of the area, cut across at intervals by wind or water gaps,

the westward-sloping mesa of Pine Mountain in the central part, and the small isolated buttes, like Dove Mountain and Black Hills, in the southwestern part, whose forms suggest past volcanic activity.

Dryden Crossing. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of dissected plain or plateau through which the Rio Grande flows just east of that part of its course which trends northeastward. No settlements except individual ranch houses have been made in the region, and all the streams are intermittent except the Rio Grande.

Electra. Scale, 1 inch=½ mile; contour interval, 5 feet.

Detailed map of Electra and part of the oil field near that town, which has built up a great industry near the Oklahoma-Texas boundary. The "tank farms" for the storage of petroleum and its products form a rather unusual feature.

Hillendahl. Scale, 1 inch=½ mile; contour interval, 1 foot.

Map of Harris County, Tex., showing a plain sloping gently southeastward, on whose surface are very many small circular depressions and which is traversed in its southern part by Buffalo Bayou, a small stream that flows in a narrow trench or canyon, the depth of which is much accentuated by the small contour interval adopted for the map.

Hood Spring. Scale, 1 inch=1 mile; contour interval, 50 feet. (Photolithograph.)

Map of a mountainous region in southwestern Texas. The mountains occur in more or less isolated groups, from the base of which spread out great sloping plains of outwash material in which the streams wither or disappear. There are no perennial streams in the area.

Indian Wells. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the Rio Grande and the dissected plains country through which it flows in a rather narrow canyon, in places nearly 1,000 feet deep. The region is practically uninhabited and is traversed by no railroads; less than 10 miles of first-class roads have been built in it, and only seven houses.

Iowa Park. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of part of the plains in north-central Texas south of Red River, traversed by Wichita River, which flows in irregular loops on a broad flood plain on whose surface are numerous terraces, cut-off lakes, and other forms produced by the river when it followed a different course.

Kelly Fields and Camp Travis. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of the San Antonio quadrangle with red overprint showing the Army camps and aviation fields in the vicinity of San Antonio. A text prepared by L. W. Stephenson, printed on the back of the map, gives an account of the more conspicuous natural features of the region.

Nine Point Mesa. Scale, 1 inch=1 mile; contour interval, 50 feet. (Photolithograph.)

Map of dissected mountainous country north of the Rio Grande in southwestern Texas, one of whose most conspicuous topographic features is the steep escarpment west of Chalk Draw, which trends northwestward and extends not only across the area of this quadrangle but is continued to the north into the Santiago Peak quadrangle. Other noteworthy features are the strong westward-facing escarpment of Nine Point Mesa and the very rugged topography of the Santiago Mountains.

Reagan Canyon. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the Rio Grande and the mountainous country north of it, which closely hems in the river and within 2 miles of the stream rises to elevations of more than 3,300 feet.

Santiago Peak. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the Santiago Mountains, a remarkable linear northward-trending range whose peaks rise to elevations of 4,500 to 5,000 feet and from whose base

plains slope eastward and westward. A short distance west of this range rises Santiago Peak, a conical mountain 6,521 feet high, whose shape and position suggest that it is an ancient volcano.

West Wichita Falls. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of the dissected plain west of Houston, in which Wichita River flows in rather angular loops through a wide-floored flood plain in which there are numerous topographic indications of cut-off lakes, terraces, cut spurs, and banks of other courses of the stream. The settlement is on the uplands. Within the area are a number of lakes, impounded behind artificial dams.

Utah.

Preston. See Idaho.

Stockton. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of the Oquirrh Mountains and the plain that slopes westward from them until it merges into the similar eastward-sloping plain from mountains farther west, forming Rush Valley, in which is a lake and playa. Along the base of the mountains the shore lines of the ancient glacial Lake Bonneville are clearly recognizable, and at the places where the streams leave the mountains they have built symmetrical alluvial cones, some of them now much dissected.

Virginia.

Aylett. Scale, 1 inch=1 mile; contour interval, 10 and 20 feet.

Map of part of the dissected Coastal Plain near its western border in Virginia, through which Mattaponi River flows in irregular angular bends in a lowland above which at many places are terraces that mark the former floors of the valley.

Camp Lee. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map formed by combining parts of maps of the Petersburg and Bermuda Hundred quadrangles to show the region adjacent to Camp Lee. A text prepared by A. W. Giles and published as a separate pamphlet by the Virginia Geological Survey describes the geology and topography of this region.

Carterton. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of Clinch River and the deeply dissected plateau region north of it. Clinch River and some of its tributaries have their courses along belts of weak or soluble rocks, mainly limestone, the depressions about a mile north of the river evidently being sink holes that have been dissolved in limestone rock. The geology of this area, together with that of much of the adjacent region, is mapped and described in Folio 59 of the Geologic Atlas, published by the Geological Survey.

Charles City. Scale, 1 inch=1 mile; contour interval, 10 and 20 feet.

Map of James River and the adjacent dissected plain, all of the upland of which is well drained, so that practically the only swamps indicated are on the flood plain or on the floors of the valleys. The depths of parts of James River are indicated by blue contours for 5, 10, and 20 feet below mean low water.

Disputanta. Scale, 1 inch=1 mile; contour interval, 10 feet. (Photolithograph.)

Map of part of the Coastal Plain of Virginia, whose uplands rise to elevations of less than 150 feet and which has been so much dissected by streams that it has a rolling topography and only small areas on the tops of the hills are flat. Most of the larger streams flow in lowlands so swampy that the roads do not follow them but are on the uplands.

Doswell. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the area north of Richmond, through which flow Mattaponi and Pamunkey rivers. The uplands show many flat areas that stand at elevations of 200 feet, but the whole region is so much cut up by streams that it is gently rolling.

Langley Field. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of the Hampton quadrangle with red overprint showing the location of Langley Field. A text prepared by L. W. Stephenson, printed on the back of the map, gives an account of the more conspicuous natural features of the region.

Smithfield. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of part of Nansemond and James rivers and the somewhat dissected series of plains whose flat uplands are locally known as "pocosons" and the highest of which stands about 80 feet above the sea.

Washington.

Connell. Scale, 1 inch=2 miles; contour interval, 50 feet.

Map of part of the rolling plateau in the southeastern part of Washington north of Snake River, a notable feature of which is the line of depressions known as Washtucna and Esquatzel coulées, which afford an excellent, nearly level grade for the tracks of the Northern Pacific Railway.

Mount St. Helens. Scale, 1 inch=2 miles; contour interval, 100 feet.

Map of the country between Cowlitz and Lewis rivers in which Mount St. Helens, a symmetrical volcanic cone on whose flanks are more than half a dozen glaciers, rises to an elevation of 9,671 feet, thus overtopping by 3,000 to 4,000 feet the highest points of the adjacent dissected upland.

Port Angeles. Scale, 1 inch =1 mile; contour interval, 25 feet. (Photolithograph.)

Map of part of Juan de Fuca Strait and of the mountainous region south of it. Some of the mountains shown rise to elevations above 6,000 feet. A striking feature is the flying sand spit known as Ediz Hook, which extends about 3 miles eastward from a headland and forms a good harbor, on the southern shore of which have been established the flourishing settlement of Port Angeles and a United States naval and military reservation.

Samish Lake. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of part of the mountains and lakes adjacent to the northeastern shore of Puget Sound. The mountains, some of whose peaks are over 3,300 feet high, rise from rather flat lowlands in which the streams in some places flow on the surface and in other places have excavated broad trenches or narrow canyons, the whole representing a region whose features have been produced largely by a complex series of events, one of the most important of which has been relatively recent glaciation.

West Virginia.

Davis. Scale, 1 inch=1 mile; contour interval, 50 feet. (Part of quadrangle.)

Map of part of the plateau west of the Allegheny front, in which is Canaan Valley, a peculiar depression about 12 miles long from northeast to southwest and about 3 miles wide, encircled by steep walls, 500 to 800 feet high, which lead to the upland. This depression is drained westward by Blackwater River through a rather narrow valley.

Richwood. Scale, 1 inch=1 mile; contour interval, 50 feet. (Part of quadrangle.)

Map of part of Nicholas County, showing dissected plateau in the southeastern part of West Virginia, whose summits stand at elevations of about 3,000 feet and in which there are but small areas of flat land.

Williamson. See Kentucky.

Wisconsin.

Ripon. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the region west of Green Bay, a glaciated plan on which are several lakes, a large number of marshes, streams that do not fit their valleys, and irregularly scattered low rolling hillocks.

Wyoming.

Como Ridge. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of a region of diverse topography, which is due largely to the structure and the varying resistance to erosion of the rocks, the harder rocks forming the ridges, which rise 500 to 700 feet above lowlands formed of weaker rocks. The main streams in this area, the two forks of Medicine Bow River, which unite to form Rock Creek, flow in exceedingly numerous and irregular small bends.

GEOLOGIC BRANCH.

SCOPE AND ORGANIZATION OF WORK.

The geologic branch is responsible for the work of the Survey in all phases of geology, except for a part of the investigations relating to underground waters. Its researches include stratigraphy, structure, petrology, paleontology, physiography, glaciology, metallography, mineralogy, chemistry, physics, and statistics of mineral production. They embrace field and office investigations, some of which are systematic and continuous but most of which consist of special problems or examinations in economic geology or scientific research and a part of which are special investigations made for other departments of the Government, or for commissions, States, and municipalities. Nearly all these investigations are made the basis of published reports, some of which are, however, printed by cooperating and outside organizations or are covered in unofficial professional or technical serials.

For the efficient accomplishment of its work in the different fields of geology the branch is organized in four divisions, as follows:

1. The division of geology, Sidney Paige, geologist in charge. This division conducts areal geologic surveys and special economic investigations and researches in geology. It is responsible for the preparation of the geologic map of the United States and for the field investigations necessary to classify and appraise the mineral lands in the public domain. It plays a leading part in mineralogic, petrographic, mining, geologic, and physiographic investigations in this country, and its paleontologic examinations include numerous studies for other branches of the Government, for States, for unofficial scientific institutions, and, to a limited extent, for foreign governments. Many of its investigations are carried on in cooperation with State geological surveys or other governmental institutions.

2. The division of Alaskan mineral resources, in charge of G. C. Martin during the absence of Lieut. Col. A. H. Brooks in France, until June, when Col. Brooks resumed charge. This division carries on topographic, hydrologic, and geologic surveys in Alaska. It describes and maps the general geology and mineral resources, makes special investigations of the geology and economic deposits of mineral districts, and reports annually the conditions and progress of the

Alaskan mineral industries and the production of mineral commodities. The division is, in fact, the principal source of knowledge as to the topography, geology, and hydrology of the Territory. To render more efficient assistance to the development of the resources of Alaska, a branch office is maintained the year around at Anchorage.

3. The division of mineral resources, H. D. McCaskey, geologist in charge until January; Edson S. Bastin, geologist in charge since January. This division is responsible for keeping the public informed as to the state of the mineral industries and the rate of production of mineral commodities in the United States. Geologists who have specialized in the different lines of economic geology and most of whom are members of the division of geology as well as of this division prepare the reports on their particular subjects printed in the annual volumes of "Mineral Resources" and such additional statements and reports on the mineral output of States and of districts and on the grades, distribution, prices, markets, etc., as may be needed by different branches of the Government. For certain minerals concerning which it is important that the public should be frequently informed reports are prepared and issued quarterly, monthly, or even weekly. The work of this division also includes the compilation and preparation for publication of information concerning the distribution of foreign mineral deposits, their geology, quality, reserves, state of development, output, and trade distribution. Branch offices of this division are maintained at San Francisco, Salt Lake City, and Denver.

4. The division of chemical and physical research, George Steiger, chief chemist, acting in charge since the death of Dr. George F. Becker, in February. This division is responsible for the chemical and physical investigations essential to the work of the geologic branch. It makes qualitative determinations of specimens sent by correspondents from all parts of the country and qualitative or quantitative determinations of metals, phosphates, potash, and other minerals collected by geologists of the staff or by cooperating organizations. It makes quantitative rock analyses, such as those which have won for the Survey world-wide distinction, and conducts physical and chemical researches bearing upon the geologic problems engaging the Survey.

The scope of the work and the activities of these divisions are more fully described in their respective reports, given below.

DIVISION OF GEOLOGY.

ORGANIZATION AND PERSONNEL.

The scientific force of the division of geology at the beginning of the year consisted of 69 geologists, 30 associate geologists, 21 assistant geologists, 3 junior geologists, and 8 geologic aids. During the year 10 members of the scientific staff resigned to take professional

positions in commercial life at higher salaries, 3 members died, 2 returned from the Army, 7 new members were appointed, and 2 were transferred from another division. The total number of geologists of various grades on the divisional staff at the end of the year was 129, a net loss of 2.

The division is organized in 11 sections, besides which its administration includes the section of geologic map editing, a part of the publication branch. In the following paragraphs are outlined the principal activities of the sections as they have been operating on a war basis; the normal provinces have been disregarded, and members of sections, including some chiefs, have applied themselves with splendid esprit to the assistance of other sections that were more directly concerned with the responsibilities of war geology of different kinds. Outlines of the normal work of the sections are given in the Thirty-eighth Annual Report, pages 43–46.

1. The section of eastern areal geology, Arthur Keith, geologist in charge, has been engaged in the examination of or search for reported deposits of manganese, chromite, tungsten, salt, high-calcium lime, white clays, and other minerals that were important to the successful prosecution of the war. Practically no field work in areal geology has been done. Some of the geologists of this section have assisted the division of mineral resources in compiling statistics of production or in preparing reports showing the distribution, character, production, and trade of the mineral products of foreign countries. The chief of the section has been for the most part occupied in the preparation of a manual of the geography of New England, including the compilation of a base map on the scale of 8 miles to the inch, in which the topography is contoured in 250-foot intervals.

2. The section of western areal geology, Sidney Paige, geologist in charge, has been occupied in the search for chromite, nitrates, potash, and sulphur, in the compilation of military geologic maps, and in the preparation of popular descriptions, for educational use, of regions surrounding a number of military camps and training stations, and these texts have been published on the backs of the corresponding topographic sheets. In these descriptions special attention is given to the explanation of the origin of the physical features of the regions. The chief of the section has had charge of the administration of the division of geology.

3. The section of Coastal Plain investigations, T. Wayland Vaughan, geologist in charge, has devoted its efforts largely to the preparation of information for the military and naval departments of the Government, including special reports on specific areas, such as assembling data for the use of the staff of the Chief of Field Artillery in selecting sites for artillery ranges and cantonments; compiling information on road-building material and on water supplies for use of the Chief of

Engineers in connection with the progressive military map of the country; and answering many inquiries regarding water supply, material for highway construction, and the nature of foundations for different kinds of structures. Special descriptions of the physical features of several cantonments and adjacent areas were prepared for printing on the backs of the topographic maps showing these areas. In the spring of 1919 several members of the section were engaged in the inspection of the salient geologic characters of the Dominican Republic and Haiti and the formulation of preliminary plans for geologic surveys of these republics.

4. The section of glacial geology, W. C. Alden, geologist in charge, has been occupied in preparing descriptive texts, in popular language, covering the physical features and their origin, of areas embracing a number of military and naval training camps; in mapping swamp, cut-over, and agricultural lands in portions of the upper Lake States; in making investigations for other branches of the Government and for States; and in compiling information regarding the mineral deposits and production of several foreign countries.

5. The section of paleontology and stratigraphy, T. W. Stanton, geologist in charge, has made practically no field studies in the States except at the request and expense of cooperating State geological surveys. Office studies of current collections, including many received from State surveys and other branches of the Government or from foreign governments, have proceeded. Two members of the section have carried on paleontologic and stratigraphic studies in Alaska, and one has devoted a part of the year to the structural mapping of several areas of prospective importance as sources of oil and gas, including helium. The geologist in charge is chairman of the committee on geologic names.

6. The section of geology of metalliferous deposits, F. L. Ransome, geologist in charge, has been devoted largely to work on immediate war-mineral needs and to the compilation of statistics and the preparation of reports on different phases of mineral production, under the auspices of the division of mineral resources. Several geologists have been occupied with the work of other sections, notably that of iron and steel alloy metals. During the earlier part of the year the systematic collection and compilation of information as to the mineral reserves and the mineral production of other countries of the world was begun in this section, but later it was transferred to the more appropriate administration of the division of mineral resources. Several chapters for a popular volume entitled "The strategy of minerals" were prepared by members of this section. The geologist in charge completed the examination of the quicksilver deposits of the country and served as a member of the committee of the Depart-

ment of the Interior appointed for the investigation of the decline in gold production.

The subsection of petrology, E. S. Larsen, jr., geologist in charge, is, on account of the intimate association of its work with that of the section of geology of metalliferous deposits, attached to that section. Mr. Larsen has determined 1,600 rock and mineral specimens for persons outside the Survey and has carefully examined about 300 specimens for members of the Survey. The rock-cutting laboratory operated under his supervision has prepared 2,139 thin sections and polished 220 specimens. Most of the regular work of the subsection has given way to the demands for examinations in behalf of other war agencies or for assistance to other geologists engaged in war work in the Survey. Mr. Larsen has submitted for publication a manuscript on the systematic determination of nonopaque minerals by means of the petrographic microscope.

7. The section of geology of iron and steel alloy metals, E. F. Burchard, geologist in charge, is preeminently a "war metal" section and, up to the signing of the armistice, was engaged in special field studies of deposits of chromium, manganese, tungsten, zirconium, molybdenum, and iron, the encouragement of the production from worthy deposits, and the dissemination of information concerning the domestic resources in these ores. The section, which is normally small, was temporarily enlarged by accessions of geologists from other sections of the division and even from other divisions. Twenty-one geologists, besides several assistants, were employed in the field. Deposits were examined in 18 States and in Costa Rica, Panama, the Dominican Republic, and Porto Rico. Systematic loose-leaf notebook schedules covering ownership, exact location, and the essential features of topography, geology, ore tonnage, and developments were mailed to the Washington office by the field geologists upon completion of the examination of each ore deposit, were filed for ready reference, and were used in preparing important summaries. From the manganese schedules was prepared a wall map showing the deposits of manganese ore in the United States, classified as to principal physical types. Cooperation was effected with several States, universities, and councils of defense; special statements and summaries were prepared for the War Industries, Shipping, and War Trade boards; and the information of greatest immediate service to the public was promptly issued through the newspapers and technical magazines. Since the armistice was signed illustrated reports on the economic geology of the many deposits studied have been in preparation or published, and many data have been prepared for the information of the War Minerals Relief Commission.

8. The section of the geology of nonmetalliferous deposits, H. S. Gale, geologist in charge, was, as in preceding years, devoted mainly

to the search for potash and nitrates and the investigation of reported deposits of these salts. In this work assistance was rendered in particular by the section of western areal geology and the divisions of Alaskan mineral resources and of chemical and physical research. Essentially all deposits of nitrates and potash reported to the War, Navy, and Interior departments were investigated in the field, and the more important, like the nitrate deposits in the Amargosa Desert of southeastern California, were very fully examined and tested in cooperation with the Ordnance Department of the War Department. Special investigations were made of a number of deposits of potash-rich silicates, including the leucite rocks of Wyoming and Arkansas, some gray iron ores in Alabama, and the greensands of New Jersey. The New Jersey greensands were examined somewhat comprehensively, with the use of the drill, in cooperation with the State Geological Survey. The work of the section included also the examination of high-grade clay deposits of the Eastern States with the object of locating and defining substitutes for clays previously imported for use in making paper, electrical equipment, and certain types of pottery. A full report on the salt deposits of the United States has been issued as Bulletin 669. The geologist in charge was in March appointed by the Secretary of the Interior a member of a committee to examine and report on the potash resources of Alsace, Spain, and western Germany.

9. The section of the geology of eastern coal fields, G. H. Ashley, geologist in charge, resumed near the end of the year, in cooperation with the State of Virginia, the detailed study and mapping of coal fields, which had been suspended during the war. Cooperation with the fuel sections of the Fuel Administration was continued, and much work was done in reducing commercial coal data to maps and files for ready availability and for use of the Fuel Administration or other branches of the Government. Consideration of questions connected with pooling and zoning of coal led to the study, by the geologist in charge, of the classification of coals in general and the preparation of a detailed and comprehensive scheme of classification. The section has been the source of information supplied to all agencies of the Government respecting the geology of the coals of the eastern United States.

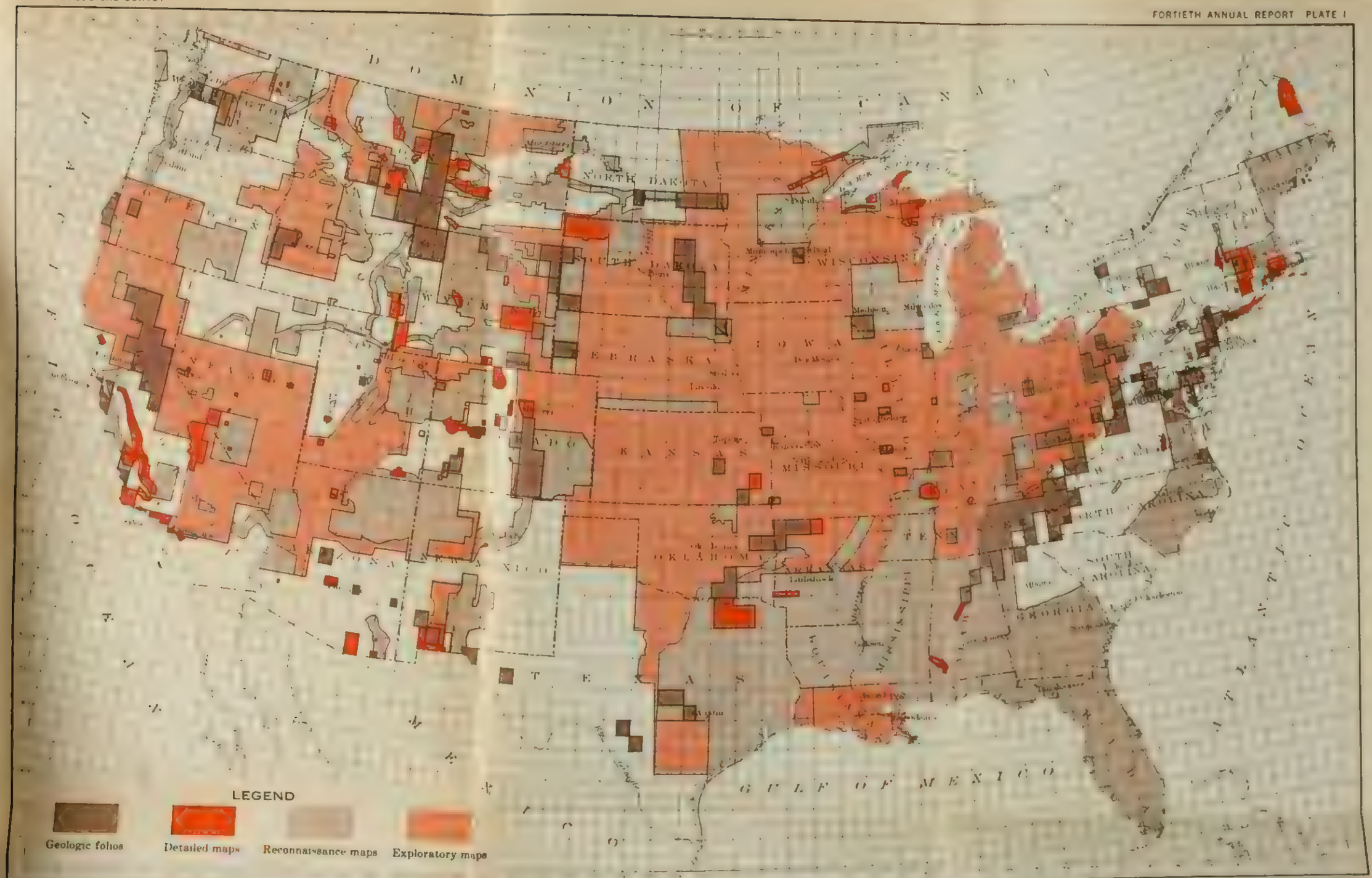
10. The section of the geology of western coal fields, M. R. Campbell, geologist in charge, made special field examinations for the California Fuel Administration or for the advice of the Government in the matter of sales of public lands but was for the most part occupied, under the auspices of other sections, in various investigations relating to war minerals, in the search for new reserves of petroleum, or in the compilation of data regarding foreign mineral

deposits. The greater part of the time of the geologist in charge, who is also chairman of the committee on physiography, was given to the preparation of educational geographic matter, including a description of the Allegheny portions of Virginia, West Virginia, and Maryland for the geographic handbook of the Virginian region, and to the critical review of texts similar in scope by other geologists and of popular geographic descriptions of the regions about the great army camps for publication by State surveys or on the backs of topographic maps covering the regions of the camps.

11. The section of the geology of oil and gas fields, David White, chief geologist, in charge, reinforced by additions from the sections of western coal fields and of stratigraphy and paleontology, has concentrated its work either on structural examinations of the most important of the prospective oil regions, with the object of locating areas most favorable for the occurrence of undiscovered oil reserves, or on special investigations of some of the more complex and important geologic problems concerning the history and structural relations of unconformably buried oil-bearing formations or affecting the mode of occurrence and relations of oil, gas, and water in different regions and under varying geologic conditions. The more important cooperative investigations of the section were made with the Bureau of Mines and the War and Navy departments in a search for helium-rich natural gas; with the Capital Issues Committee of the Treasury Department in examinations and reports on applications for capitalization; and with the Bureau of Internal Revenue in the compilation of the records of production of oil and gas fields, the calculation of rates of depletion, and the formulation of rules to govern the application of income-tax laws to the depletion of oil and gas field properties.

The committee on geologic names, T. W. Stanton, chairman, during the year examined 88 manuscripts comprising 10,702 pages and involving 3,256 geologic names. In addition it did a large amount of work on the stratigraphic catalogue of the United States, preparatory to completing the "stratigraphic lexicon."

The physiographic committee, of which M. R. Campbell is chairman, has given much attention to the scope and matter of the geographic handbooks for the New England States and the Virginian region and to the preparation of popular educational descriptions of the origin of the physical features of the regions surrounding 11 of the large army cantonments and training stations. Considerable progress has been made in collecting definitions of technical physiographic terms, and the card catalogue in preparation by the committee now contains about 6,800 definitions of 2,000 technical words and expressions used in physiographic mapping and description.



AREAS COVERED BY GEOLOGIC MAPS PUBLISHED BY UNITED STATES GEOLOGICAL SURVEY PRIOR TO JULY 1, 1919

PUBLICATIONS.

The publications of the fiscal year 1919 prepared wholly or partly in the division of geology embrace 7 professional papers, 11 bulletins, 1 water-supply paper, 35 chapters of reports to be published later as complete volumes, and 1 geologic folio. Titles and brief abstracts of these publications are given on pages 491–506. Besides the official publications 47 papers were, with the permission of the Director, published by scientific societies or in scientific and technical journals. Seven reports based on work done in cooperation with State geological surveys have been transmitted to the States for publication.

PROGRESS OF GEOLOGIC MAPPING.

The areas in the United States [1] covered by geologic maps published by the Survey and the general nature of the work in each area are shown on Plate I. This map does not, however, indicate areas for which reports prepared by this Survey have been submitted for publication to cooperating State organizations or to other bureaus and departments of the Federal Government.

Owing to the nature of the war work, consisting largely of examinations with estimation and sampling of local deposits scattered through broad regions of the country, of which portions are incidentally reviewed in reconnaissance, the aggregate area covered by detailed surveys and classification of lands during the year is much smaller than usual. Much exploratory mapping has been accomplished in the great "red beds" region of the Southwest in the course of the potash nvestigations. A detailed statement of the work is given below.

Progress of geologic mapping, fiscal year, 1918–19.

	Square miles.
Detailed mapping	3,150
Reconnaissance mapping	6,350
Exploratory mapping	32,370
	41,870
Lands classified	1,150

FINANCIAL STATEMENT.

The total funds available for the geologic work of the Survey in the United States for the fiscal year 1918–19 were as follows:

Geologic surveys	$347,073.50
Scientific assistants	17,700.00
Search for potash deposits (part of appropriation for chemical and physical researches)	12,019.71
	376,793.21

[1] The progress of geologic surveying in Alaska is described in the section on the division of Alaskan mineral resources (pp. 575–581).

The expenditures classified by subjects were approximately as follows:

Economic geology of metalliferous deposits (mainly war minerals)	$89,124.00
Economic geology of nonmetalliferous deposits (mainly potash, nitrates, and other war minerals)	46,161.71
Economic geology of fuels (oil, gas, coal, and peat)	65,435.00
Special examinations and studies on account of military and naval affairs	18,000.00
Training-camp geography, geographic handbooks, and related educational work	11,250.00
Scientific researches not directly connected with war work (paleontology, etc.)	16,143.00
Supervision, administration, salaries of clerical, technical, and skilled-labor forces, instruments, and supplies	108,171.16
Land-classification board	22,508.34
	376,793.21

Of the amounts allotted to this division $72,260.35 was used directly for field expenses, including the search for potash. Approximately 68 per cent of this amount was expended west of the one hundredth meridian and 32 per cent east of it. With the $22,508.34 for the operations of the land-classification board, very nearly 74 per cent of the total, exclusive of the allotment for supervision, was spent for investigations west of the one hundredth meridian—that is, essentially in the public-land States. The expenditures for supervision, etc., are divisible in about the same proportion between the eastern and western work.

COOPERATION.

As may be inferred from the foregoing outlines of the character of the work performed in the division, there has been cooperation between the sections without reference to permanent administration boundaries, though the administrative organization has been retained intact. Twenty geologists of the division of geology, cooperating with the division of mineral resources, have compiled and submitted for publication annual, monthly, or weekly reports on the production of certain mineral commodities, besides numerous special statements prepared and submitted for the information of other branches of the Government. Ten geologists have taken part in the work on foreign mineral resources. Mutual cooperation has been effective between the division and the other field branches of the Survey, and cooperative assistance has been rendered to other bureaus of the department, notably the General Land Office, the Bureau of Mines, and the Office of Indian Affairs.

As will be noted in other parts of this report, this division has, through the preparation and submission of special reports or through special field investigations, cooperated with the Ordnance, Aviation,

and other departments of the War and Navy departments; also with the War Trade Board, the War Industries Board, the Fuel Administration, the Food Administration, the Capital Issues Committee, the Bureau of Internal Revenue of the Treasury Department, the Tariff Commission, the Bureau of the Census, the Bureau of Standards, the State Department, the Shipping Board, the Railroad Administration, the Federal Trade Commission, the Department of Justice, the Forest Service, and the Office of the Supervising Architect of the Treasury. In its scientific investigations it has cooperated informally with the Smithsonian Institution, the Bureau of Lighthouses, the Bureau of Fisheries, the Coast and Geodetic Survey, and the research laboratories of the Carnegie Institution. Investigations have been undertaken or planned at the request of the governments of the Dominican Republic, Haiti, the Virgin Islands, and Porto Rico. Assistance has been given to the geologic departments of a number of universities and colleges.

In strictly geologic investigations or paleontologic studies the Survey, through the division of geology, has assisted the geological surveys or equivalent agencies in 30 States—Alabama, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Jersey, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Virginia, West Virginia, and Wisconsin. Informal cooperation exists between the Survey and all the States having geological surveys.

GENERAL FEATURES OF THE WORK OF THE YEAR.

The plans under which the work of the division of geology was in June and July, 1918, organized for the year were based on the necessity for assuring mineral supplies adequate to meet the shipping emergencies and industrial demands of the war. During the first half of the year practically all the available resources of the division, in funds and in geologists, were concentrated on the successful outcome of the struggle. As will later be seen in reviewing the work in detail, organization lines were largely lost sight of in emulative cooperation for the great purpose.

The last half of the year, however, has been a period of transition and genuine reconstruction. The systematic and determined search for new deposits of war materials; the qualitative appraisal and quantitative inventory of reserves in sight; and the monthly, weekly, or daily accounting of the production and distribution of essential war mineral commodities have, with the cessation of hostilities, been followed by the completion of the immediate field projects, the orderly summation and conservation of the economic and military results, and the salvage, so to speak, and methodical organization and record

of the scientific observations and discoveries resulting as by-products of the war work. The search for high-grade or more easily available ores has given place to classified estimates of the reserves in the ground for future use in war or peace; sampling and calculations of tonnage are followed by contributions to our knowledge of the conditions of ore genesis; special inquiries as to underground water supply, road-building materials, drainage, rare minerals, etc., arising from military needs, have shown the way to better methods and new features of geologic mapping and description and to broader conceptions in geography and geology. Geologists have learned much, and geology and geography, both as research and as teaching sciences, have benefited by the war.

Meanwhile, however, as will appear in the report of the division of mineral resources, the necessity for tiding some of our mineral industries over a post-war transitional period of unusual susceptibility to economic accidents and disasters has as yet permitted but partial relaxation in the precautionary task of keeping both the industries and the public informed as to the mineral outputs, stocks in hand, and trade conditions. The continuation of frequent reports showing the rate of production of coal, for example, is essential to the welfare of both the producer and the consumer. Consequently it has not yet been possible for some of the geologists fully to put aside their wartime duties and to return to their pre-war investigations, though this return, which is most desirable, is being brought about as rapidly as circumstances permit.

Among the more important undertakings in which the division of geology has been engaged during the year is a completion of the census of certain war-mineral resources of the country, notably manganese, chromite, and quicksilver. Estimates of petroleum remaining in the ground also were completed. The coal resources of the country had already been computed.

The compilation of data with maps showing the distribution of the mineral deposits in foreign countries, their quality and extent, the output of the districts and regions, and the trade distribution in world commerce, made for the use of the Peace Commission, has proved so valuable and informing to all the agencies that have had the opportunity to use it and evidently will be of so great importance to the American investor, engineer, and economist that it has been decided not only to make public the data in hand but to continue and keep the compilation up to date for the benefit of American industry and commerce. This service should do much to promote the ultimate industrial welfare, foreign trade, and prosperity of the United States. This work, though carried on by geologists of the division of geology, is administered as part of the operation of the division of mineral resources, in the report of which it is more fully described.

The special investigations made at the request of the military and naval authorities and of other agencies responsible for the successful conduct of the war have during the year been not less varied or less numerous than in the preceding year. Among others, they have included the search for smudge-ingredient minerals, for porous rocks to be used in making more buoyant concrete ships, and for underground water supplies for many cantonments and military and naval training stations in different States and in the West Indies; examinations of target ranges, determinations of locations for military storage; examinations and quantitative estimates of natural-gas resources; and investigations of nitrate and potash deposits both at home and abroad.

One of the searches of more than usual interest was that for helium, which, on account of its incombustibility and lightness, is particularly desired for balloon inflation. In the course of this investigation, which was made at the request of the Bureau of Mines for the War and Navy departments, the natural-gas fields of the country were examined, the helium-rich gases were located, the daily helium output of the different fields was computed, their geologic sources were ascertained, and the life of the fields and the supply of helium-rich gas in reserve in the ground were estimated. In addition to the progress reports transmitted to the cooperating agencies, a final report on the sources of helium, its distribution in the earth, its mode of occurrence, and the available reserves has been submitted by G. S. Rogers for publication as a bulletin of the Survey.

The restriction by an allied country of exportation to America of high-grade clays near the end of the war led to an investigation of deposits of high-grade clay in the eastern United States that might be substituted for imported clays in paper making and in the manufacture of porcelain and electrical equipment. The results of this successful search are embodied in a valuable report by Prof. Heinrich Ries, the well-known specialist in the geology of clays.

Another undertaking prompted by war contingencies was a reconnaissance survey of the principal peat deposits of the eastern United States for the purpose of locating and describing peats that in emergencies might be used as fuel in regions remote from the coal fields, and more particularly of promoting at all times a larger and more widespread use of peat for the fertilization of the soil, not only as an ingredient of mixed fertilizers but as itself a valuable fertilizer for certain soils, inasmuch as many of our peats contain more nitrogen than some of the commercial fertilizers sold during the war. A report by Prof. E. K. Soper on the peat resources of the Lake, New England, and Atlantic Coast States, available for use as fuels or fertilizers, is now in preparation.

Among other reports submitted for publication may be mentioned several that are noteworthy though not of military importance, such as the monograph on the geology and ore deposits of the Leadville district, Colo., begun by the late S. F. Emmons and nearly completed by the late Capt. J. D. Irving; a somewhat similar study of the geology of the Ducktown district, Tenn., by W. H. Emmons, F. B. Laney, and Arthur Keith; and a professional paper on the Laramie flora, by F. H. Knowlton. A report on the geology and ore deposits of the Ray and Miami districts, Ariz., by F. L. Ransome, now in press as Professional Paper 115, is a genuine contribution to general geology, as well as an illuminating demonstration of the conditions of occurrence and the relations, genesis, and distribution of the ore deposits. Other reports of unusual interest now in press are two professional papers on the Sunset-Midway oil field, Calif., in one of which (Prof. Paper 116) the geology and oil resources of the field are described in detail by R. W. Pack, and in the other (Prof. Paper 117) the geochemical relations of the oil, gas, and water are discussed by G. S. Rogers. A catalogue of Mesozoic and Cenozoic fossil plants, by F. H. Knowlton, is in press as Bulletin 696; and a bibliography of the platinum group of metals, 1797–1918, by J. L. Howe and H. C. Holtz, as Bulletin 694. A monographic discussion of the Eocene floras of southeastern North America, by Prof. E. W. Berry, is in preparation. "Ore deposits of Utah," by B. S. Butler and others, "Iron-depositing bacteria and their geologic relations," by E. C. Harder, and "Gypsum deposits of the United States," by R. W. Stone, are in press as Professional Papers 111 and 113 and Bulletin 697, respectively. The manuscript of a general paper on Ordovician and early Silurian crinoids is nearly completed by E. O. Ulrich, and a discussion of the oil fields of California, submitted by W. B. Emery, forms the first chapter of a bulletin on the "Oil resources of the public-land States." This report (Bulletin 689) is designed to present succinctly a summary of many of the reports now out of print and no longer obtainable describing withdrawn prospective oil and gas lands in the public-land States, and at the same time to express the best judgment of the writers as to the relative merits and prospects from the oil man's standpoint of different portions of these States. The 1917 edition of the large wall map showing the oil and gas fields of the United States having become exhausted, the data have been compiled in far greater refinement for issue in a new map, which is nearly ready for submission.

Notwithstanding the comparatively slow progress in the publication of scientific reports during the war, a number of volumes have been issued, among which some of more than usual interest or importance are Professional Paper 106, "The Quaternary geology

of southeastern Wisconsin, with a chapter on the older rock formations," by W. C. Alden; Professional Paper 107, "Geology and ore deposits of the Tintic mining district, Utah," by Waldemar Lindgren and G. F. Loughlin, with a historical review by V. C. Heikes; Bulletin 669, "Salt resources of the United States," a comprehensive report by W. C. Phalen; and Bulletin 693, "The evaporation and concentration of waters associated with petroleum and natural gas," by R. V. A. Mills and R. C. Wells. The last-mentioned paper leads into a too long neglected field of oil-field geochemistry and geophysics and is the precursor of investigations of the greatest importance to the oil industry, as well as to theoretical geology.

Two monographs, one on the early Tertiary Bryozoa, the other on the late Tertiary Bryozoa of North America, by F. Canu, of Versailles, France, and Dr. R. S. Bassler, of the United States National Museum, prepared for publication by the Survey, are now being issued by the National Museum on account of congestion of unpublished material in the publication branch of the Survey during the war.

A general account of the work of the geologists of the Survey would not be complete without mention of the important researches conducted by several members of the staff under the direction of T. W. Vaughan through cooperative arrangements with the Smithsonian Institution, the Carnegie Institution, the Panama Canal Commission, and the United States Bureau of Fisheries. A number of the reports based on these investigations in the West Indies and Central America are enumerated in previous reports and on pages 103 and 105 in this report. In addition the following papers by members of the Survey are published as parts of Publication 213 of the Carnegie Institution:

1. Some shoal-water corals from Murray Island (Australia), Cocos-Keeling Islands, and Fanning Islands, by T. W. Vaughan.

2. Some shoal-water bottom samples from Murray Island (Australia), and comparisons of them with samples from Florida and the Bahamas, by T. W. Vaughan.

3. Composition of two Murray Island bottom samples according to source of material, by M. I. Goldman.

4. Salinity of ocean water at Fower Rocks, Florida, by R. B. Dole and A. A. Chambers.

5. The solubility of calcite in contact with the atmosphere and its variation with temperature, by R. C. Wells.

6. The temperature of the Florida coral-reef tract, by T. W. Vaughan.

A paper entitled "Corals and the formation of coral reefs," by T. W. Vaughan, is in press as a part of the annual report of the Smithsonian Institution for 1917.

As a consequence of the exigencies of transoceanic carriage of essential war materials from distant ports during the war, and the resulting investigations of numerous known and reported deposits of manganese, chromite, and other minerals at different points in the West Indian Islands and Central America, there has arisen in several

of the republics an active interest in geologic exploration and mapping, with the object of procuring more complete information as to their natural resources, including the underground water supplies, the mineral deposits, and the building materials. The Government of the Dominican Republic early in the year appropriated funds for the topographic and geologic mapping of the country and requested the United States Geological Survey to take charge of the work. As noted elsewhere (p. 573), a preliminary geologic inspection of the Republic has been made for the purpose of ascertaining the general structural and stratigraphic conditions, and paleontologic collections necessary for use in the classification of the formations have been brought back for examination by the Survey specialists. The Haitian Republic has taken similar action and has allotted the funds for a reconnaissance of the geology and mineral resources of that country also. Plans for both of these surveys, for which the United States Geological Survey is expected to lend the scientific staff and take direction, are already largely formulated. Other calls on the Survey for geologic work in the West Indies are mentioned in other parts of this report.

A most regrettable feature of the year, the gravity of which is accentuated by the extraneous calls just noted, is the resignation of a number of the ablest young geologists of the corps. Greatly increased costs of living, with a lack of corresponding betterment in salaries, has imposed a burden of hardships which after the armistice, when the appeal of patriotism was less strong, could no longer be endured. Six members of the staff have resigned to enter private employment during the last six months of the year. All these are geologists receiving commercial compensations ranging from twice to four times the salary paid by the Government for the same genius, ability, training, and experience.

The geologic work of the division has extended into every State, the Canal Zone, Porto Rico, the Virgin Islands, and the Hawaiian Islands, as well as into the Dominican and Haitian republics, for the development of which this country is under treaty obligations. Through its paleontologic or other investigations the Survey has contributed to the knowledge of the geology of Canada, Mexico, Nicaragua, Costa Rica, Panama, Venezuela, Peru, Argentina, and Cuba and several other islands of the West Indies.

WORK OF THE DIVISION, BY STATES.

ALABAMA.

A popular description of the nature and origin of the physical features in the region around Camp McClellan and Anniston was prepared by F. E. Matthes and printed on the back of the special map covering that region. Information on material available for

the construction of roads within the confines of the camp was transmitted to the military officers, at whose request a geologic map of the Anniston quadrangle, with a typewritten explanatory sheet, was prepared and submitted.

The Upper Cretaceous flora of Alabama is described by Prof. E. W. Berry in Professional Paper 112, issued in August, 1919. Fossil plants from the middle and upper Eocene formations of the State are described by Prof. Berry in a monographic report now awaiting publication by the Survey. Tertiary Foraminifera are described in two manuscripts by J. A. Cushman, one on the genus *Lepidocyclina* and the other on the genus *Orthophragmina*, submitted for publication by the Survey. Mr. Cushman has in preparation a report on the foraminiferal fauna of the Oligocene Byram marl. The older Tertiary Eocene and Oligocene Bryozoa of the State are described by F. Canu and R. S. Bassler in a monographic report prepared for the United States Geological Survey but being published as Bulletin 106 of the United States National Museum. Reports on invertebrate fossils from the Eocene deposits of the State were made by W. H. Dall, and some collections of Tertiary fossils were identified by C. Wythe Cooke.

The deposits of gray iron ore in the vicinity of Talladega were examined by Laurence LaForge, who sampled some of the ores for analysis, in order to determine their capacity to yield potash as a by-product of the blast furnace.

The stratigraphy at several points in the Columbiana, Montevallo, Bessemer, and Vandiver quadrangles was reexamined by Charles Butts. Some of the deposits of high-grade limestone in the Tennessee Valley were examined by Arthur Keith, with the object of advising the War Department as to the sources of high-grade calcium carbonate for use in the manufacture of nitrates.

The Mississippian formations were examined at several localities near Huntsville by Mr. Butts in connection with the correlation of the Mississippian formations of western and central Kentucky and eastern Tennessee.

ARIZONA.

A report on the deposits of manganese ore in Arizona, by E. L. Jones, jr., and F. L. Ransome, has been submitted for publication in "Contributions to economic geology, 1919." The more important results of the search for manganese in the Colorado River desert region and adjacent areas in bordering States were given to the public through the press in October, 1918. Data on the deposits of manganese ore in the State are contained in a review by E. C. Harder and D. F. Hewett of recent studies of domestic manganese deposits, published by the American Institute of Mining and Metallurgical Engineers.

Alleged deposits of platinum in the Grand Canyon were examined and reported on by Mr. Ransome, who completed his description of the Ray quadrangle for publication as a folio. His report on the copper deposits of Ray and Miami is in press as Professional Paper 115.

Deposits near Animas and San Simon, Cochise County, reported to be rich in nitrates, were examined by L. F. Noble.

Collections of invertebrate fossils from the Tertiary were studied by W. H. Dall.

ARKANSAS.

The deposits of leucite rock in the Magnet Cove district of Arkansas were examined and mapped in detail by F. C. Calkins, who sampled them for analysis, with special reference to their possible utilization as a source of potash.

An examination of the stratigraphy, with reference to oil and gas possibilities, near Batesville was made by H. M. Robinson, and a report on the natural-gas resources available to Little Rock was made by E. W. Shaw.

The results of the investigations of the manganese deposits in the vicinity of Batesville are embodied in a report by H. D. Miser now nearly completed. Data on the deposits of manganese ore are contained in a review by E. C. Harder and D. F. Hewett of recent studies of domestic manganese deposits, published by the American Institute of Mining and Metallurgical Engineers.

By request of the Department of Justice, certain sunken lands in the eastern part of the State were examined by Frank Leverett, the results being communicated in the form of testimony for the use of that department.

A popular descriptive text of the major physical features of the Little Rock quadrangle, which includes Camp Pike, was prepared by L. W. Stephenson and H. D. Miser, and an edition of the topographic map, with the text printed on its back, was issued.

Fossil plants from the middle and upper Eocene formations of Arkansas are described by Prof. E. W. Berry in a report submitted for publication. Eocene Bryozoa are described by F. Canu and R. S. Bassler in a monographic report prepared for the Survey, but being published as Bulletin 106 of the United States National Museum.

The study of the fossil fauna of the Morrow formation was continued by G. H. Girty, and a preliminary study of the invertebrate fossils of Silurian age from the St. Clair formation was made by R. D. Mesler.

CALIFORNIA.

In cooperation with the California Bureau of Mines, the State Council of Defense, and the University of California, a detailed examination of the chromite and manganese deposits of the State

was completed in the autumn of 1918. Chromite deposits in Siskiyou, Shasta, Del Norte, Trinity, and Tehama counties were examined by J. S. Diller, who has prepared a report on the chromite deposits in the Klamath Mountain region of southwestern Oregon and northwestern California, for publication in "Contributions to economic geology," and a general report on recent studies of domestic deposits of chrome ore, for publication by the American Institute of Mining and Metallurgical Engineers. Chrome deposits in Amador, Humboldt, Lake, Mariposa, Mendocino, Napa, San Benito, Santa Barbara, Santa Clara, Sonoma, and Stanislaus counties were examined by Prof. G. D. Louderback, who submitted schedules covering the character, quality, development, production, and reserves of a large number of the chrome and manganese deposits of the State.

Manganese deposits in the desert region adjacent to Colorado River in southeastern California were examined by E. L. Jones, jr., and his report on these deposits is now in press as Bulletin 710–E. The results of most immediate war importance were promptly given to the press. Data on the deposits are contained in the review by E. C. Harder and D. F. Hewett, published by the American Institute of Mining and Metallurgical Engineers.

Deposits of tungsten ore at several points in San Diego and Inyo counties were examined by E. S. Larsen, jr., in cooperation with Mr. Means of the Bureau of Mines. A paper on the contact-metamorphic tungsten deposits has been prepared by F. L. Hess and E. S. Larsen for publication by the American Institute of Mining and Metallurgical Engineers.

The quicksilver prospects in Siskiyou County were examined by F. L. Ransome in connection with a general study of the quicksilver resources of the Western States, and the Temescal tin mine near Corona was examined by Adolph Knopf.

After an investigation of the platinum-bearing placers and rocks of northern California and Oregon, a report on the platinum reserves of these States is now in preparation by L. M. Prindle.

The results of an examination of nitrate deposits supposed to be of commercial importance in the region embracing Amargosa Valley, by H. S. Gale, G. R. Mansfield, L. F. Noble, F. C. Calkins, and Theodore Chapin, were transmitted to the Chief of Ordnance, United States Army, and are now in preparation by Mr. Gale and Mr. Noble for publication by the Survey. During the year Mr. Noble has visited and examined nitrate deposits in a number of other areas in southern California. None of the deposits were found to be of commercial importance, though small amounts of reasonably rich salts were present. Office file reports have been submitted by Mr. Noble on the regions examined.

In order to advise the California Fuel Administration as to the coal available for supplying the local market, the coal deposits at Stone Canyon, Monterey County, the Dos Rios coal field, in Mendocino County, and the lignite field at Ione, Amador County, were examined by M. R. Campbell, who submitted reports on them to the State authorities. The lignite at Ione, although a poor fuel compared with standard coal, was found on distillation to yield about 62 gallons of oil to the ton.

Detailed areal mapping of the Corona quadrangle was carried on by W. A. English and W. S. W. Kew. The economic results will be used in a report by Mr. English on the southern California oil fields. Special detailed examinations of the San Jose, Puente Hills, and Whittier-Fullerton areas were made by Mr. English. A number of points in the Camulos quadrangle were inspected by Mr. Kew, who is preparing a report on the geology and oil reserves of the Los Angeles-Ventura region. The results of the detailed studies of the structure and of the oil sands, with reference to oil production and the occurrence of water in the Sunset-Midway field, have been submitted in a full report on the field, in two parts, one by R. W. Pack on the geology and oil resources, in press as Professional Paper 116, and the other by G. S. Rogers, on the geochemical properties of the oil, gas, and water, in press as Professional Paper 117.

In view of the increasing interest of the public in oil possibilities of now undeveloped regions, a report on the oil resources of the public-land States is in preparation as Bulletin 689. The first chapter of this bulletin, discussing the oil prospects of undeveloped areas in California, has been submitted by W. B. Emery and is nearly ready for the printer.

In connection with his study of the Tertiary invertebrate faunas of the Pacific coast, Tertiary and recent mollusks from the vicinity of Point Fermin and La Jolla, near San Diego, were examined by W. H. Dall. A collection of Upper Cretaceous invertebrates from the Los Angeles region was identified by T. W. Stanton. A species of the foraminiferal genus *Orthophragmina* from California is described by J. A. Cushman in a paper submitted for publication. Late Tertiary Bryozoa from the State are described by F. Canu and R. S. Bassler in a monograph prepared for the Geological Survey but being published as a bulletin of the United States National Museum.

COLORADO.

The oil-shale deposits in Battlement Mesa and an area near Grand Valley, Colo., were mapped by D. E. Winchester and will be described in a report on "Oil shale of the Rocky Mountain region."

The results of the examinations of manganese deposits in different parts of the State, studied in the early part of the year, have been compiled by E. L. Jones, jr., for publication in "Contributions to

economic geology." The Federal Survey cooperated with the Colorado Geological Survey in the preparation of a bulletin published by the State.

A description of the oxidized zinc ores in the Leadville district by G. F. Loughlin, has been issued as Bulletin 681. Additional data relating to the geology and ore deposits of the district were gathered by Mr. Loughlin for the completion of a monograph left unfinished by the late Capt. J. D. Irving.

Pitchblende ores in the vicinity of Jamestown were examined by Mr. Loughlin, and the molybdenite deposits near Climax were examined by F. L. Hess.

A reconnaissance somewhat in detail of the Twentymile Park district of the Yampa coal field, in Routt County, embracing about 150 square miles, was made by M. R. Campbell to determine the number and thickness of coal beds underlying Twentymile Park.

Special examinations of coal lands in North Park, Jackson County, and in Tongue Mesa, Ouray County, were made by Mr. Campbell for the purpose of gathering data for the classification and valuation of the coal lands.

A report on the "Geology and mineral resources of the Axial and Monument Butte quadrangles, Moffat County," has been revised for publication by E. T. Hancock, and a report on "Coal south of Mancos, Montezuma County, Colo.," by A. J. Collier, has been issued as Bulletin 691–K.

A report entitled "The Laramie flora of the Denver Basin, with a review of the Laramie problem," has been submitted by F. H. Knowlton for publication as a professional paper. Mr. Knowlton also has in preparation a monograph on the flora of the Denver formation. Small collections of Cretaceous invertebrates, obtained by D. E. Winchester, were reported on by T. W. Stanton.

"Geology and ore deposits of the Creede district, Colo.," is the title of a report by W. H. Emmons and E. S. Larsen, jr., to be issued as a bulletin.

CONNECTICUT.

The lime belt of Connecticut and western Massachusetts has been examined by T. Nelson Dale, whose report is now in preparation.

The peat deposits of the State are described in general in a comprehensive report by Prof. E. K. Soper on the peat resources of the United States available for fuel and fertilizer.

The handbook of the geography of New England, which will include a description of the geographic features of this State, in which the Connecticut Valley region is described by Prof. W. M. Davis, is now approaching completion by Arthur Keith.

Some of the deposits of high-grade clay in Connecticut were examined by Prof. Heinrich Ries in connection with his investigations of white clays of the eastern United States that might be used

in substitution for grades of clay for which this country has long been dependent on foreign importations.

DELAWARE.

Information on well waters between New Castle and Middletown, Del., was furnished to the Construction Division of the United States Quartermaster Corps by T. W. Vaughan.

FLORIDA.

Information was furnished to the Navy Department as to the adequacy of the water supply from wells at Key West, Fla., and data on well waters at Jacksonville and Tampa were furnished to the Railroad Administration by T. W. Vaughan.

The upper Miocene and Pliocene Foraminifera of Florida are described by J. A. Cushman in Bulletin 676, recently issued. Other fossil Foraminifera from the State are described in two papers by him, one on the genus *Lepidocyclina*, the other on the genus *Orthophragmina*, submitted for publication. The same author is preparing a report on the lower Miocene Foraminifera of the State. The Tertiary corals of Florida were further studied by T. W. Vaughan. The fossil Bryozoa are described in two monographs by F. Canu and R. S. Bassler, one on the lower Tertiary, the other on the upper Tertiary Bryozoa of North America, both prepared for the United States Geological Survey but being published as bulletins of the United States National Museum. The Pleistocene invertebrate fossils of the State are under investigation by W. H. Dall.

The gypsum deposits of the State have been described by R. W. Stone in a general report on the gypsum deposits of the United States, now in press as Bulletin 697. In connection with this work Mr. Stone examined the phosphate rocks at a number of localities.

The peat resources of Florida are discussed with reference to their use as fertilizers or as fuel by Prof. E. K. Soper in a general report on the peat deposits of the Lake and Atlantic Coast States.

GEORGIA.

The granite quarries of Georgia were examined by G. F. Loughlin, and the garnet and corundum deposits of Towns County were examined by F. J. Katz and are described in a report submitted for the use of the Bureau of Mines.

A popular description of the nature and origin of the physical features in the country around Camp Gordon, by F. E. Matthes, has been published on the back of the topographic map of the region. This work was done in cooperation with the State Geological Survey.

At the request of the State geologist, the stratigraphy and areal geology of the Cartersville district were examined by Laurence LaForge. A report on the geology and physiography of the district

by Mr. LaForge has been published as Bulletin 35 of the State Geological Survey, a part of a general report on the manganese resources of Georgia. A press notice giving the information of the most immediate importance was issued by the Federal Survey. Data on the deposits of manganese ore are contained in the recent studies of domestic manganese deposits by E. C. Harder and D. F. Hewett, published by the American Institute of Mining and Metallurgical Engineers.

The geology of a part of the Coastal Plain of Georgia is described by C. W. Cooke and H. K. Shearer in Professional Paper 120–C "Deposits of Claiborne and Jackson age in Georgia." Collections of fossils from the Coastal Plain were examined and identified by Mr. Cooke.

The Upper Cretaceous flora of Georgia is described by Prof. E. W. Berry in Professional Paper 112, issued in August, 1919. An account of the middle and upper Miocene of the State by the same author is awaiting publication. Descriptions of fossil Foraminifera of the genera *Lepidocyclina* and *Orthophragmina* are contained in two reports submitted by J. A. Cushman, who has in preparation other reports on the foraminiferal faunas of the State. A study of the Tertiary corals of Georgia was continued by T. W. Vaughan. The Eocene and lower Oligocene Bryozoa of Georgia are described by F. Canu and R. S. Bassler in Bulletin 106 of the United States National Museum, entitled "North American early Tertiary Bryozoa."

IDAHO.

An area embracing seven quadrangles in southeastern Idaho, previously mapped in detail on a large scale on account of its rich and very extensive phosphate deposits, is covered by a professional paper now in preparation by G. R. Mansfield.

A description by Mr. Mansfield of the geology and mineral resources of the Fort Hall Indian Reservation is now in process of publication.

Mr. Mansfield also submitted a report on a search for coal in eastern Idaho, for publication in "Contributions to economic geology."

Carbonaceous shales in Georgetown Canyon and on Thomas Fork were sampled by D. Dale Condit and Frank Reeves for distillation tests to determine their value as possible sources of oil.

Quicksilver deposits in the Yellow Pine and Black Pine districts and a tungsten deposit near Corral were examined by E. S. Larsen, jr.

"A reconnaissance of the Pine Creek district, Idaho," is the title of a report submitted by E. L. Jones, jr., for publication in "Contributions to economic geology" (Bulletin 710–A).

The results of tests of some of the bituminous shales associated with the phosphate deposits to determine the importance of the shales as possible sources of oil are given by D. Dale Condit in Bulletin 711–B, now in the hands of the printer.

ILLINOIS.

The examination of the areal and economic geology of the Equality and Shawneetown quadrangles, Ill., was continued by Charles Butts, in cooperation with the State Geological Survey. In connection with this work sections at Grand Tower and Thebes were examined for purposes of correlation.

A popular description of the region including Camp Grant, devoted particularly to the explanation of the origin of the physical features of the region, was prepared with the assistance of Prof. R. D. Salisbury and has been published on the back of a topographic map covering this region.

The geology and resources of the Colchester and Macomb quadrangles, examined in cooperation with the State Geological Survey, are described and mapped by Henry Hinds in Folio 208.

INDIANA.

The high-grade clays of Indiana that are usable in substitution for certain foreign clays were examined by Prof. Heinrich Ries during the autumn of 1918 and will be described in a general report by Prof. Ries on the white clays of the eastern United States.

In connection with the cooperative stratigraphic mapping and correlation of the older Carboniferous formations of the Ohio and upper Mississippi valleys inspections of the Mississippian formations exposed near Salem, Bedford, and Crawfordsville were made by Charles Butts.

The peat deposits of the State are discussed in a general report by Prof. E. K. Soper on the peat resources of the United States available for use as fuel or fertilizer.

IOWA.

A popular description of the region about Camp Dodge, with special reference to the origin of its physical features, has been prepared by W. C. Alden, of this Survey, and James H. Lees, of the Geological Survey of Iowa, and has been printed on the back of the topographic map of the region that includes Camp Dodge.

KANSAS.

The investigations of the geologic structure and oil and gas possibilities of the region including Eldorado, Kans., carried on in cooperation with the State Geological Survey, were completed by A. E. Fath, who has prepared a report describing and mapping the region. Some conclusions of immediate importance to the driller were promptly given to the press. A report by Mr. Fath, entitled "Origin of faults and anticlines in the Mid-Continent oil fields," has been submitted for unofficial publication.

In connection with the survey of the sources and the quantitative estimate of the possible supplies of helium-rich natural gas in the United States, structural mapping was done by P. V. Roundy in Chautauqua County. A report by G. S. Rogers on the helium resources of the United States embraces the results of Mr. Roundy's investigations. Mr. Roundy also examined for the information of the Capital Issues Committee of the Treasury Department the geologic structure of a portion of Cowley County.

Invertebrate fossils from certain of the Carboniferous formations of Kansas were given some attention by G. H. Girty.

KENTUCKY.

A report on the results of the investigation of the geologic structure and oil and gas prospects of Allen County, Ky., by E. W. Shaw and Kirtley Mather, was issued in June as Bulletin 688.

In continuation of the cooperative studies of the stratigraphy, with correlations of the Mississippian formations of the Ohio Valley, the older Carboniferous formations in Meade and Bullitt counties were examined by Charles Butts. This work begins a general study of the Mississippian throughout middle and eastern Kentucky, conducted in cooperation with the State Geological Survey.

A popular description of the physical features of the country around Camp Taylor, by Mr. Butts, has been published on the back of the topographic map of the region.

Sections of the Paleozoic formations near Terrill and Lexington were studied by E. O. Ulrich.

LOUISIANA.

In response to the request of the municipal government of Shreveport, La., an examination of the gas reserves in the region tributary to that city was, under cooperative auspices, made by E. W. Shaw. The conclusions were transmitted in a brief informal report to the commissioner of public utilities and thus made public.

Foraminifera found in the cuttings from a number of wells in the State were examined by J. A. Cushman with the object of determining the age and identity of some of the rocks penetrated in the borings.

Information on the ground-water resources in the vicinity of Camp Beauregard was furnished to the officers of that camp by T. W. Vaughan.

The middle and upper Eocene floras of Louisiana are described by Prof. E. W. Berry in a paper now awaiting publication. The upper Oligocene Foraminifera of the genus *Lepidocyclina* are described by J. A. Cushman in a report submitted for publication as a part of Professional Paper 125. The Eocene Bryozoa are described by F.

Canu and R. S. Bassler in the monographic report being published as Bulletin 106 of the United States National Museum.

MAINE.

In connection with the preparation of the handbook of the geography of New England, reconnaissances of the portions of Maine not previously covered by topographic maps were nearly completed by Arthur Keith, with the object of furnishing the material for a topographic map on a scale of 8 miles to the inch, with 250-foot contours. This manual, which is now nearing completion, will be adapted to use in general educational work.

The peat deposits of Maine were reviewed in the autumn of 1918 by Prof. E. K. Soper, for description in a comprehensive report on the peat resources of the United States available for use as fuel or fertilizer. This report is nearly ready for editing.

MARYLAND.

The deposits of chrome ore and the mining developments at Soldier's Delight, near Baltimore, Md., were examined by Miss E. F. Bliss, and these deposits and those near State Line have received attention in a summary of recent studies of domestic deposits of chrome ore, by J. S. Diller, submitted for publication by the American Institute of Mining and Metallurgical Engineers.

The section of the Miocene formation near Chesapeake Beach was examined by W. C. Mansfield, and a report on the fossil invertebrates obtained there was made by W. H. Dall. The Miocene Foraminifera of Maryland are described by J. A. Cushman in Bulletin 676, recently published. The Tertiary Bryozoa of the State are described in a monograph prepared for the Geological Survey by F. Canu and R. S. Bassler but being published by the United States National Museum.

The geography of Maryland is described in a handbook on the geology of the Virginian region, now nearing completion. The Coastal Plain, the Piedmont Belt, the Appalachian Valley, and the Allegheny portions of the State are described by L. W. Stephenson, Laurence LaForge, G. W. Stose, and M. R. Campbell, respectively.

The physiography of the Coastal Plain and Piedmont province of Maryland was the subject of study by T. W. Vaughan.

Information on sources of clay for use at Edgewood Arsenal was furnished to the authorities there by T. W. Vaughan.

MASSACHUSETTS.

The dolomite and calcite limestone deposits and quarries in western Massachusetts were examined and mapped in detail by T. Nelson Dale for description in a report on the limestones and dolomites of Massachusetts and Connecticut.

The country embracing Camp Devens was described in popular terms by Prof. W. W. Atwood in an account of the origin of the physical features which has been printed on the back of the topographic map of the region.

An inspection of the excavation along Cape Cod Canal was made by Prof. J. B. Woodworth, who also examined sets of samples that had been procured in connection with that work. Supplemental work was done by Prof. Woodworth on a manuscript prepared by him which includes accounts of the geology of Cape Cod, Nantucket, and Marthas Vineyard.

The handbook of the geography of New England, in which the geographic features of the Connecticut Valley are described by Prof. W. M. Davis and the remaining regions by Arthur Keith, is nearly ready for submission for publication as a bulletin.

The peat deposits of the State are described and mapped somewhat in detail by Prof. E. K. Soper in a general report, nearly ready for publication, on the peat resources of the Lake and Atlantic coast regions, available for use as fuel or fertilizer.

MICHIGAN.

In cooperation with the Geological Survey of Michigan, the geology of the Battle Creek, Galesburg, Union City, Leonidas, and Kalamazoo quadrangles, which embrace Camp Custer, was examined and mapped by Frank Leverett, whose report thereon has been submitted for publication by the State. Meanwhile a popular description of the geography of the vicinity of the camp, with an explanation of the origin of the surficial features, has been prepared by Mr. Leverett and printed on the back of the topographic map covering the area.

A set of maps showing the surface geology and agricultural conditions of northern Michigan and in the northern counties of the southern peninsula have been prepared by Mr. Leverett on the scale of 1:250,000. Progress has also been made by Mr. Leverett in preparation of his professional paper on "The Quaternary geology of the Lake Superior region."

A report on Silurian invertebrates collected in the State has been made by E. O. Ulrich.

To promote a more extensive use of peat as a fertilizer and to furnish more adequate data as to its availability as a fuel, the peat deposits of the State were examined by Prof. E. K. Soper and are to be described by him in a voluminous report, with maps, covering the peats of the Lake and Atlantic Coast States.

MINNESOTA.

A "Preliminary report on the geology of east-central Minnesota, including the Cuyuna iron ore district," by E. C. Harder and A. W. Johnson, has been issued as Bulletin 15 of the Minnesota Geological

Survey, in cooperation with which the field and office investigations were conducted. About forty representative iron ores from the Mesabi, Vermilion, Cuyuna, Marquette, Menominee, Gogebic Michipicoten, and Crystal Falls iron-ore districts of the Lake Superior region, besides several fluxing limestones and blast-furnace cokes, were analyzed for potash by the University of Minnesota School of Mines Experiment Station, in a cooperative search for potash in the raw materials utilized in the iron industry.

A monograph on the Quaternary geology of the State is now in preparation by Frank Leverett, whose report on "Surface formations and agricultural conditions of southern Minnesota" is now in process of publication as a bulletin of the State Survey. Maps showing the surficial geology of the northeastern part of the State and of northern Wisconsin and northern Michigan are now being prepared by Mr. Leverett to meet the demand for maps of poorly settled tracts. A general report on the Pleistocene geology of the Lake Superior basin, by Mr. Leverett, is now being written.

The available information as to the peat resources of the State is summarized by Prof. E. K. Soper in a comprehensive report on the peat deposits of the Lake and Atlantic Coast States and their utilization as fuel or fertilizer.

The Cambrian faunas of the State are under revision by E. O. Ulrich.

A cooperative report on the clays and shales of the State, by F. F. Grout and E. K. Soper, is now in press as Bulletin 678.

MISSISSIPPI.

Information was furnished by T. W. Vaughan on the ground-water conditions in the vicinity of Forest, Miss., in connection with making estimates for drilling wells for the Railroad Administration.

A report on the ground waters of Mississippi is in preparation by L. W. Stephenson, who devoted the major part of the year to work on it. In June he returned to Mississippi in order to procure additional information needed for the completion of the report.

The Upper Cretaceous flora of Mississippi is described by Prof. E.W. Berry in Professional Paper 112, now in press. The middle and upper Eocene floras of the State are described by Prof. Berry in a report submitted for publication as a professional paper. Tertiary Foraminifera of the genus *Lepidocyclina* are described by J. A. Cushman in a report awaiting publication, and a report on the foraminiferal fauna of the Oligocene Byram marl is in preparation by the same author. The Eocene and Oligocene Bryozoa of the State are described by F. Canu and R. S. Bassler in Bulletin 106 of the United States National Museum.

MISSOURI.

Deposits of manganese ore in the vicinity of Cornwall and at Ironton, Mo., were examined by H. D. Miser with reference to the quality and quantity of ores that might be produced.

MONTANA.

A study of the manganese ore deposits in the Philipsburg district, Mont., was made by J. T. Pardee, with special reference to the quality of the ore recoverable and the extent of the available reserves. Reports by Mr. Pardee entitled "Manganese at Butte, Mont.," and "Some manganese deposits in Madison County, Mont." have been published as parts E and F, respectively, of Bulletin 690. Data on the manganese deposits are contained in a review by E. C. Harder and D. F. Hewett of recent studies of domestic manganese deposits, published by the American Institute of Mining and Metallurgical Engineers.

Deposits of iron ore near Stanford, Fergus County; of chrome ore in Stillwater and Sweetgrass counties, and of tungsten ore in Deer Lodge County were examined by L. G. Westgate. Reports giving the results of Mr. Westgate's investigations have been submitted for publication in "Contributions to economic geology." Data on the chrome and tungsten deposits have also been incorporated in papers by J. S. Diller and by F. L. Hess and E. S. Larsen that have been submitted for publication by the American Institute of Mining and Metallurgical Engineers.

An inspection of the geology, mining developments, and ore deposits in the New World (Cook City) district was made by Mr. Pardee, who has partly prepared a report thereon.

A summary report on the coal fields of Montana, by A. J. Collier, is near completion, but its publication will probably be delayed in order to issue reports on other more important regions. A report on the Scobey lignite field has been revised by Mr. Collier for publication.

In the course of field investigation, with tests, of the carbonaceous shales associated with phosphates in western Montana and Idaho, with special reference to their capacity to yield oil on distillation, D. Dale Condit sampled deposits of oil shale in the regions of the Bridger Mountains and the Little Belt Mountains and at numerous points near Dillon and southward to the Idaho line. The results of the tests are given in a report on "Oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah," to be issued in the current volume of "Contributions to economic geology" (Bulletin 711-B).

Progress has been made by W. C. Alden in the preparation of a manuscript on the Quaternary geology of the Glacier National Park and northeastern Montana.

A report on the "Geology and oil and gas prospects of the Huntley field, Mont.," by E. T. Hancock, has been submitted for publication in "Contributions to economic geology, 1919" (Bulletin 711–G).

"Gradations from continental to marine conditions of deposition in central Montana during the Eagle and Judith River epochs" is the subject of a paper by C. F. Bowen, based upon his detailed studies of the stratigraphy in the general region. This paper (now in press) will be issued in "Shorter contributions to general geology" (Professional Paper 125–B).

Reports on anticlines in the Musselshell Valley, by C. F. Bowen, and on the structure of the Lake Basin field, by E. T. Hancock, have been issued as parts F and D, respectively, of Bulletin 691.

NEBRASKA.

The alkali-lake district of western Nebraska was examined by W. B. Hicks, with the object of getting information as to the extent and value of the potash resources of the region.

NEVADA.

Several deposits of manganese ore in Nevada were examined by Prof. J. Claude Jones, of the State University, and the manganese deposits near Las Vegas were studied by E. L. Jones, jr. The field examinations were made in cooperation with the State University and the United States Bureau of Mines. A report on the deposits of manganese ore in the State (Bulletin 710–F) has been prepared by Mr. Jones and J. T. Pardee, who made mineralogic studies of the ores, Prof. Jones being unable to continue the work. Press notices, giving the principal facts as to the qualitative and quantitative value of the manganese deposits in White Pine County and in the Colorado River desert region of Nevada and neighboring States, were promptly issued.

Tungsten ores in Nevada were examined by E. S. Larsen in cooperation with Mr. Means, of the Bureau of Mines, and descriptions of these deposits have been included in a paper by F. L. Hess and Mr. Larsen, submitted for publication by the American Institute of Mining and Metallurgical Engineers.

At the end of the year work was resumed by H. G. Ferguson on a report on the geology and ore deposits of the Manhattan district, an investigation that had been laid aside during the war.

Reports on collections of Triassic invertebrate fossils from northwestern Nevada were made by T. W. Stanton, and small lots of Eocene and Carboniferous invertebrates were examined by W. H. Dall and G. H. Girty, respectively.

After his examination of the platinum deposits in the Goodsprings district and of the tin deposits of Majuba Hill, Adolph Knopf prepared a report on the latter locality.

The deposits of oil shale in the vicinity of Elko were examined in detail by J. P. Buwalda, who then visited reported occurrences of oil shale and of coal in other parts of the State. In the course of this work Mr. Buwalda inspected and sampled clay deposits near Beatty, Elko, and Winnemucca and investigated reported potash deposits near Alamo, Blair Junction, Lovelocks, Ely, and the Silver Peak Marsh. A report on the Elko oil shale has been submitted by Mr. Buwalda.

NEW HAMPSHIRE.

The geography of New Hampshire is described by Arthur Keith in a handbook on the geography of New England, which is approaching completion. In this bulletin, which is designed for use as a manual, a topographic map on the scale of 8 inches to the mile, with 250-foot contours, will be used, and much of the topographic information has been furnished by Mr. Keith.

The peat resources of the State are described, with analyses and a discussion of their possible utilization as fuel or fertilizer, in a general report by Prof. E. K. Soper on the peat deposits of the Lake and Atlantic Coast States.

NEW JERSEY.

With the object of procuring adequate qualitative and quantitative data as to the adaptation of the greensand marls of New Jersey to the production of potash, examinations of these deposits, with testing by the drill and sampling throughout a large area, were carried out in cooperation with the State. The work was in charge of G. R. Mansfield, who is now preparing a report on the geologic and chemical results. A preliminary report on the work has been contributed to the State geologist for publication in his annual report.

The peat deposits of the State, which are of great value and have long been used, are described by Prof. E. K. Soper in a general report on the peat resources of the Lake and Atlantic Coast States, with special reference to their availability for use as fuel or fertilizer. This report is nearly ready for submission for publication as a bulletin of the Survey.

The zircon deposits in the northeastern part of the State were, early in the year, examined by W. T. Schaller with reference to the quantity of the mineral available and its adaptability for military purposes.

NEW MEXICO.

Work on the report on the "red beds" region of New Mexico, with special reference to the possibility of the occurrence of potash deposits in association with the thick deposits of salt in this region, was continued by N. H. Darton at the end of the field season. In the course of these investigations Mr. Darton has, during the last three

years, compiled or made the necessary surveys for the preparation of a topographic map of the State on the scale of 12 miles to the inch, with 100-meter contours. This map will serve as the base for a geologic map of the State to accompany the above-mentioned report.

In view of the great demand for information as to regions of anticlinal and domal structure and the possibility of their yielding oil and gas, Mr. Darton has nearly completed a report on the larger structural features of the State.

Anticlinal structure in Alamosa Valley, Socorro County, is described in a report nearly ready for submission by D. E. Winchester.

A reported nitrate deposit in southern Grant County was inspected by Mr. Darton, and other rumored deposits in the vicinity of Las Animas were investigated by L. F. Noble.

After a long interruption on account of work of more importance to the military program of the country, the preparation of the report on the ore deposits of the Santa Rita quadrangle was resumed by A. C. Spencer. A reported discovery of tin ore near Mogollon was inspected by Adolph Knopf and will receive further investigation.

The deposits of manganese ore in the vicinity of Socorro were examined by E. L. Jones, jr., and are described in his report on the "Deposits of manganese ore in New Mexico," which has been submitted for publication in "Contributions to economic geology" (Bulletin 710–B). The principal facts of war importance were promptly given to the press. The Federal Survey also cooperated with the State School of Mines in the preparation of a bulletin on manganese ores, published by the State. Data on the manganese deposits are contained in the paper by E. C. Harder and D. F. Hewett, published by the American Institute of Mining and Metallurgical Engineers.

On returning to the Survey after his discharge from the Army, Lieut. J. B. Reeside, jr., resumed the study of the data collected in 1915, 1916, and 1917 on the coal deposits of the San Juan region. Data for the classification of the land have also been prepared by Mr. Reeside.

A small area near Lumberton, Rio Arriba County, was examined by M. R. Campbell for the purpose of gathering information regarding the number and thickness of coal beds present, so as to determine the valuation to be placed on the lands.

Fossil bones discovered in the course of the investigation by Mr. Reeside are described in a paper by C. W. Gilmore on "Reptilian faunas of the Torrejon, Puerco, and underlying Upper Cretaceous formations of San Juan County, N. Mex," which is now in press as Professional Paper 119.

A report on "Coal in the Fruitland formation, San Juan County," by C. M. Bauer and J. B. Reeside, jr., is now in the hands of M. R. Campbell with a view to its early publication.

Publication of the report of W. T. Lee on coal in the Raton Mesa region is delayed in order that Mr. Lee may incorporate in it the results of exploration and development subsequent to his field examinations.

Reports on collections of Cretaceous invertebrate fossils in different parts of the State have been made by T. W. Stanton, and on small collections of Paleozoic invertebrates by Edwin Kirk.

NEW YORK.

A popular report describing the geographic features of the region embracing Camp Mills was prepared by W. C. Alden and published on the back of the topographic map of the region.

A geologic map and a map showing ground-water resources of each of the quadrangles in Long Island, with specially prepared overshects to indicate the application of the geologic data to military purposes, were prepared by W. C. Alden.

Collections of Silurian invertebrates from this State were given preliminary classification by R. G. Mesler, and the stratigraphy of the Clinton was discussed by E. O. Ulrich.

Deposits of clay that may possibly be suitable for substitution for clays formerly imported were examined by Prof. Heinrich Ries in the summer of 1918 and are described in a report by Prof. Ries, now ready for publication.

To promote a more extended use of peat as a fertilizer and to furnish, under war conditions, more adequate data as to its availability as a fuel, the peat deposits of the State were examined and have been described in a report by Prof. E. K. Soper on the peats of the Lake and Atlantic Coast States.

NORTH CAROLINA.

Most of the work of the Survey in North Carolina during the year has been done in cooperation with the State Geological Survey. At the request of the State authorities the marls and limestones were investigated with reference to their availability for use for fertilizer, lime, road making, or general building. The marls of the eastern region were examined by E. W. Berry and J. A. Cushman, and a report written by Prof. Berry has been submitted for publication by the State Survey. The limestones of the Paleozoic area were examined by G. F. Loughlin, whose report is nearly ready for transmission to the State geologist.

A special report on water supply and sources of power for the proposed artillery cantonment (later named Camp Bragg) at Fayetteville was prepared for the Chief of Field Artillery under the direction of T. W. Vaughan. Subsequently L. W. Stephenson made a special field investigation of the resources (particularly material

suitable for concrete work) of Camp Bragg and vicinity and submitted a report of the results to the Construction Corps of the United States Army.

A special report on the geology of southern North Carolina adjacent to the border of the Coastal Plain and Piedmont was prepared by Mr. Stephenson for the Bureau of Yards and Docks, Navy Department; and a special report on the seismicity of the southeastern United States with particular reference to southern North Carolina was prepared by Prof. J. B. Woodworth, also for use by the Bureau of Yards and Docks.

Possible supplies of the more important war minerals in the State were both quantitatively and qualitatively reviewed in the early part of the year. The deposits of chrome and manganese ore were examined by J. Volney Lewis and F. C. Schrader, and a report on the chromite deposits of the State has been submitted by Mr. Lewis for publication in "Contributions to economic geology." Mr. Lewis made a reconnaissance for undeveloped chromite deposits in the peridotite areas in the northwestern part of the State. Deposits of zircon and monazite were investigated by W. T. Schaller.

Garnet and corundum deposits in Jackson and Clay counties were examined by F. J. Katz, who prepared reports for submission to the governmental agencies most concerned with the supply of abrasives needed for war purposes.

At the request of the State geologist a study of the principal deposits of iron ore in the State was begun by Prof. W. S. Bayley about the middle of June. It is purposed to carry this work to a stage permitting estimates of ore reserves and indicating possible extensions of present ore bodies or the occurrence of undiscovered deposits in favorably situated areas.

Many localities at which clays that may be substituted for imported clays have been worked or are reported to occur were reviewed by Prof. Heinrich Ries and Prof. W. S. Bayley, and a report by Prof. Bayley has been prepared for publication by the State Geological Survey. A summary of the results, including tests of samples by the Bureau of Mines, will be included in a general report by Prof. Ries on the high-grade clay deposits of the Eastern States.

Descriptions by J. A. Cushman of the Miocene and Pliocene Foraminifera of North Carolina are contained in Bulletin 676, recently issued. The early Tertiary and late Tertiary Bryozoa of the State are described by F. Canu and R. S. Bassler in the monographic reports being published as bulletins of the United States National Museum.

The peat deposits of North Carolina are discussed, with special reference to their availability for use as fertilizer and fuel, in a report by Prof. E. K. Soper on the peats of the Lake and Atlantic regions

of the United States. A portion of the peat-bearing area in the extreme northeastern part of the State is described and mapped in detail by C. C. Osbon in a report submitted for publication in "Contributions to economic geology" (Bulletin 711–C).

NORTH DAKOTA.

Reports on the New Salem lignite field, N. Dak., by E. T. Hancock, and the Mannarth lignite field, by C. J. Hares, have been revised by M. R. Campbell for publication.

The marine fauna of the Lance formation has been studied by T. W. Stanton.

OHIO.

A report on the geology of the Wellsville quadrangle, Ohio, by James H. Hance, has been submitted and is undergoing critical review.

The peat deposits of the State are discussed by Prof. E. K. Soper in a report on the peat resources available for fuel or fertilizer uses in the Lake and Atlantic Coast States. This report is nearly ready for publication as a bulletin.

OKLAHOMA.

The detailed structure mapping of the "west side" of the Osage Reservation, Okla., was compiled by Mr. Bowen, assisted by C. S. Ross, C. E. Dobbin, P. V. Roundy, and Frank Reeves, and the report is now in press as part S of Bulletin 686, "Structure and oil and gas resources of the Osage Reservation, Okla." The remainder of the "east side," in the Hominy quadrangle, was examined by R. H. Wood and C. E. Dobbin. A report describing the structure and oil resources of the area in the Hominy quadrangle, by Mr. Wood, is approaching completion for publication as a separate bulletin. Three additional chapters of Bulletin 686 are in press or under examination or revision and will be issued at an early date. The investigations in the Pawhuska quadrangle have been under the general supervision of Capt. K. C. Heald. Besides the geologists already mentioned, O. B. Hopkins, D. E. Winchester, W. A. English, Sidney Powers, J. P. Buwalda, H. M. Robinson, W. B. Emery, M. I. Goldman, E. R. Lloyd, F. R. Clark, K. F. Mather, and R. V. A. Mills have contributed to the reports published or in process of publication.

At the request of the Indian Office the geologic structure of the Chilocco Reservation was examined in February by Capt. K. C. Heald, whose report, with map, was promptly transmitted to the Commissioner of Indian Affairs.

The geologic structure and oil prospects of a part of Jefferson County are set forth in a short report submitted for publication by H. M. Robinson, whose examinations of certain areas in Pontotoc

and Hughes counties will be covered in a report now in preparation. A short report on the oil possibilities of a small area adjoining Red River, in the southern part of the State, was also prepared by Mr. Robinson and submitted to the Office of Indian Affairs.

The general structure of a portion of Marshall County, as mapped by H. M. Robinson, O. B. Hopkins, and Sidney Powers, is given in a paper by L. W. Stephenson, entitled "A contribution to the geology of northeastern Texas and southern Oklahoma," issued as Professional Paper 120–H. Detailed descriptions, with maps, will be found in a report by Messrs. Hopkins, Robinson, and Powers, submitted for publication in "Contributions to economic geology."

A short report on the manganese deposits of the State, examined by D. F. Hewett in cooperation with the State Geological Survey, was prepared by Mr. Hewett.

The zircon deposits near Cache, in the Wichita National Forest, were studied in August, by F. L. Hess, who prepared a report as to their availability for use in the manufacture of munitions. This examination was made at the request of the War Department, in cooperation with the Bureau of Mines.

The coal resources of the State were studied quantitatively and qualitatively by G. H. Ashley, who is preparing a summary report on the coal fields of Oklahoma for publication as a chapter in Professional Paper 100.

Collections of the Carboniferous invertebrates from the State, recently received by the Survey, were studied by G. H. Girty.

As a part of the field investigation and laboratory studies connected with the search for commercial potash deposits in the United States, the salt plains of western Oklahoma were examined and sampled by O. C. Wheeler, who occupies the field laboratory near Amarillo, jointly conducted by this Survey and the Texas Bureau of Economic Geology and Technology. Through the cooperation of many of the oil companies the logs of wells penetrating saline deposits in the region are submitted for examination, and cuttings and samples of brines from many points are examined by Mr. Wheeler, with especial reference to their potash content.

OREGON.

Deposits of manganese ore in the Lake Creek district, Jackson County, Oreg., were examined by J. T. Pardee; deposits of chrome ore in Josephine and other counties of the Klamath Mountains by J. S. Diller; and deposits of chrome ore in the eastern part of the State by L. G. Westgate. Reports on chromite in the Klamath Mountains and in eastern Oregon have been prepared by Mr. Diller and Mr. Westgate, respectively, for publication in "Contributions to economic geology," and data on chrome ore are given by Mr. Diller in his

review submitted to the American Institute of Mining and Metallurgical Engineers, and on manganese ore in the review by E. C. Harder and D. F. Hewett similarly published. Schedules reporting production capacity, reserves, etc., for manganese deposits in Curry, Jackson, and Josephine counties were compiled and submitted by Prof. G. D. Louderback.

A report on the platinum resources of California and Oregon is in preparation by L. M. Prindle. Quicksilver deposits in the Medford district, Jackson County, were examined by J. T. Pardee.

The region about the Rose Valley Borax Works near Andrews was examined by J. P. Buwalda, as a possible source of potash.

In view of the necessity for the discovery and development of new oil fields, and of the widespread interest in the possible discovery of oil and gas in commercial amounts in Oregon, an examination of the Tertiary formations east of the Cascade Mountains, to be conducted in cooperation with the State Bureau of Mines and Geology, was begun by Mr. Buwalda near the end of June.

PENNSYLVANIA.

The iron ore deposits and development at Rittenhouse Gap, in Berks County, Pa., were examined by Miss E. F. Bliss and E. C. Harder, in cooperation with the Bureau of Mines. Miss Bliss made a magnetic survey of the Gap district and submitted a report on it for the information of the War Industries Board.

A report on the economic geology of the Fairfield and Gettysburg quadrangles, by G. W. Stose, has been transmitted to the State geologist for publication by the State.

A detailed description, with maps, of the geology and mineral resources of the Somerset and Windber quadrangles has been nearly completed by G. B. Richardson, who has made considerable progress on the study of the geology and oil and gas resources of the New Kensington quadrangle.

The preparation of a general summary report on the bituminous coal deposits of the State, to be published as a chapter of Professional Paper 100, has occupied part of the time of G. H. Ashley, who has given particular attention to the establishment of a new system for classifying coals according to their chemical analysis.

In connection with the studies of high-grade clays that may possibly be suitable for substitution for imported clays, a month was spent by Prof. Heinrich Ries in the examination and sampling of a number of clay deposits, including several of great promise. The work was conducted in cooperation with the State geologist, and the results will be included in a general report which has been submitted by Prof. Ries on the high-grade clays of the eastern United States.

Collections of fossils from the Ordovician formations at several localities in the central regions of the State have been under examination by E. O. Ulrich.

Brief examinations of the graphite deposits at several localities were made by H. G. Ferguson.

A report entitled "Economic geology of the Allentown quadrangle, Pa.," has been submitted by Prof. B. L. Miller for publication as a bulletin by the Survey.

Several small deposits of peat in the northern portion of the State were examined by Prof. E. K. Soper in connection with the preparation of his report on the peat resources available for use as fuel or fertilizer in the Lake and Atlantic Coast States.

RHODE ISLAND.

The physical features of Rhode Island are described by Arthur Keith in a handbook on the geography of New England, which is nearly ready for submission as a publication of the Survey.

The peat resources of the State are briefly described in a general report by Prof. E. K. Soper, with special reference to the utilization of peat as fuel or fertilizer.

Some supplemental work was done by Prof. J. B. Woodworth on a report that includes accounts of the geology of the Elizabeth Islands and Block Island.

SOUTH CAROLINA.

The geologic conditions within certain areas in South Carolina that were considered as possible sites for a radio plant were examined for the Navy Department by T. W. Vaughan and L. W. Stephenson.

Data on well water at Poston were furnished to the Railroad Administration by C. W. Cooke.

A preliminary report on the geology and ground waters of the State is in preparation by Mr. Cooke, who devoted the major part of the year to that work. In connection with the preparation of this report, Mr. Cooke contributed for use as a part of the progressive military map of South Carolina, well data and other information of military importance, all of which was placed at the disposal of the Chief of Engineers, U. S. Army.

Miocene and Pliocene Foraminifera from South Carolina are described by J. A. Cushman in Bulletin 676, recently published. The early Tertiary and late Tertiary Bryozoa of the State are described by F. Canu and R. S. Bassler in bulletins of the United States National Museum.

In the course of searches for and investigations of supplies of essential war minerals deposits of manganese and pyrite were examined by J. Volney Lewis and F. C. Schrader. A report by Mr. Lewis on the manganese ores is nearly completed.

A number of granite quarries of the State were examined by G. F. Loughlin.

The clay mines and some of the more important reported deposits of high-grade clays in the State were studied and sampled by Prof. W. S. Bayley, whose report, including the results of the tests of samples by the Bureau of Mines, is incorporated in a general report by Prof. Heinrich Ries on the high-grade clays of the Eastern States that are possibly suitable for replacing clays hitherto imported.

To promote a more extensive use of peat in fertilizers or as fuels, the peat deposits of the State were examined in the autumn of 1918 by Prof. E. K. Soper and are described in his general bulletin on the subject.

SOUTH DAKOTA.

The tin deposits recently exploited at Hill City and Keystone, S. Dak., were examined by Adolph Knopf in August.

The geologic structure around Rapid City and Hot Springs was briefly examined by E. T. Hancock, with reference to the possibility of obtaining oil and gas.

TENNESSEE.

The greater part of the geologic work carried on by the Survey in Tennessee during the year was done in cooperation with the State Geological Survey.

The deposits of manganese ore in the eastern part of the State were examined by G. W. Stose and F. C. Schrader, who gave particular attention to the discovery of new deposits through the application of physiographic, structural, and stratigraphic principles that have been found by the Survey to exert a large control on the location and mode of occurrence of the manganese deposits in this general region. A detailed geologic map of the area has been prepared by Mr. Stose and a representative of the State Survey. A report on the manganese deposits of east Tennessee, by Messrs. Stose and Schrader, based on the work of the previous year, was published by the Tennessee Geological Survey in "The resources of Tennessee" for July and October, and a press bulletin was issued by the Federal Survey. The manganese and iron ores in the Sweetwater and Cleveland areas were briefly examined by E. F. Burchard, in company with Mr. Stose and E. O. Ulrich, who gave particular attention to the stratigraphy and paleontologic correlation of the deposits. Data on the manganese deposits are contained in the paper by E. C. Harder and D. F. Hewett published by the American Institute of Mining and Metallurgical Engineers.

The stratigraphy and structure of portions of Overton, Scott, Fentress, and Pickett counties were examined with special reference to oil and gas possibilities by Charles Butts, with assistance furnished

by the State, and a report with a map embodying the results has been transmitted for publication by the State geologist.

Mr. Butts also examined, for purposes of correlation, a section of Mississippian formations near Cowan and Sherwood.

In order to review the results of recent mining developments, the Ducktown district was revisited in February by F. B. Laney, and the results are to be included in the report on that district by W. H. Emmons, F. B. Laney, and Arthur Keith.

The deposits of white clay in western Tennessee were visited and sampled by Prof. Heinrich Ries in cooperation with the State geologist, with the object of procuring more adequate information as to the suitability of some of these clays as a satisfactory substitute for clays now imported.

Collections of fossil invertebrates from the Lenoir and Mosheim limestones were studied by E. O. Ulrich and R. D. Mesler, and Upper Cretaceous fossils from Coon Creek were prepared for review by T. E. Williard. The Upper Cretaceous flora is described by Prof. E. W. Berry in Professional Paper 112.

TEXAS.

Detailed studies of the geologic factors involved in the oil-field development in north-central Texas were begun in November, 1918, with E. R. Lloyd in charge, and were continued in 1919 under the supervision of K. C. Heald, with whom were associated C. S. Ross, P. V. Roundy, Frank Reeves, M. I. Goldman, C. E. Dobbin, and several instrument men with geologic training. Studies of the stratigraphy, structure, physiography, and paleontology were carried on both in the oil fields and in the central mineral region, to the south, where the oil-bearing Bend series crops out. Problems that involve determination of the criteria to permit definite subsurface correlation between wells and districts, and the establishing of the relations between the structure shown by the surface beds and that of the deep-lying oil-bearing Bend series, which is separated from the surface beds by two or more unconformities, demanded the undertaking of petrographic and micro-paleontologic investigations. These investigations are being made in Washington by M. I. Goldmand and P. V. Roundy, respectively, and promise to be two of the most important and helpful lines of study in connection with the oil-field problems under consideration by the United States Geological Survey. In this work the Survey is cooperating with the Texas Bureau of Economic Geology and Technology and with geologists outside the Survey who are interested in the outcome of the investigations. Descriptions of several areas with discussions of surface structure will soon be ready for publication as progress reports and will be introductory to the detailed reports, which will involve the

major problems connected with the development of the oil fields. This work covers parts of Eastland, Palo Pinto, Stephens, Brown, San Saba, Comanche, and McCullough counties.

A reconnaissance examination of a part of the Coastal Plain bordering the Rio Grande, with special reference to the underground water resources and the broad structural features that may affect the occurrence of oil and gas in commercial amount, was begun in June by A. C. Trowbridge and A. G. Maddren. The area to be examined will include portions or all of Maverick, Dimmit, Webb, Lasalle, Zapata, Jim Hogg, Starr, Brooks, Willacy, Hidalgo, and Cameron counties and will adjoin on the southwest the area previously covered by Dr. Alexander Deussen.

The examination of well cuttings and brines in the saliferous red beds of eastern New Mexico, northern Texas, southwestern Kansas, and western Oklahoma was continued during the summer and autumn by R. K. Bailey, who visited many borings to obtain samples and records and conducted work in the laboratory at Amarillo. Later the work was carried forward in cooperation with the Texas Bureau of Economic Geology and Technology, with Orby C. Wheeler as cooperative investigator. No potash deposits of commercial importance have been discovered, but the rapid spread of wildcat drilling in the basins that are known or believed to contain great thicknesses of salt insures abundant data to determine the potash-yielding possibilities of the saliferous areas.

The results of studies of the general stratigraphy and structural features of portions of Grayson, Fannin, and Lamar counties are described in Professional Paper 120–H, by L. W. Stephenson, who was assisted in the field by O. B. Hopkins and Sidney Powers.

A popular discussion of the physical features in the vicinity of Kelly Fields and Camp Travis, near San Antonio, was prepared by Mr. Stephenson and printed on the back of the San Antonio map. The studies in Bexar County were made with the cooperation of Dr. J. A. Udden, director of the State bureau, to whom copies of Mr. Stephenson's notes and maps were forwarded.

A map of Lasalle and McMullen counties, showing the locations of all known artesian wells, was transmitted to the office of the Chief of Engineers, United States Army, as a contribution to the military map of southwest Texas. Information on water resources and data on material available for highway construction were also transmitted to the Chief of Engineers.

Supplemental work on the paper on "Ground waters of the Coastal Plain of Texas west of Brazos River" was done by Alexander Deussen, and another report by Mr. Deussen on the "Geology of the

Coastal Plain of Texas between Brazos and Nueces rivers" is awaiting publication by the Survey.

The middle and upper Eocene floras of Texas are described by Prof. E. W. Berry in a manuscript now awaiting publication, and a second manuscript by the same author entitled "An Eocene flora from trans-Pecos Texas" has been submitted for publication as Professional Paper 125–A. The early Tertiary Bryozoa of the State are described by F. Canu and R. S. Bassler in a monograph prepared for the Survey but being published as Bulletin 106 of the United States National Museum.

A short paper by G. H. Girty on the fossil faunas of the Bend group was contributed for publication by the Association of American Petroleum Geologists, and more detailed studies of the same faunas were begun. The revision and description of the Comanche faunas were continued by T. W. Stanton, who submitted a special report on a small collection from the Edwards limestone of central Texas and on Cretaceous invertebrates from Presidio County and from the Abilene quadrangle. Miocene invertebrates in southeastern Texas were examined by W. H. Dall, and reports on Tertiary fossils found in cuttings from several oil wells were made by C. Wythe Cooke.

Rumored occurrences of nitrate in Presidio and Brewster counties were examined by H. M. Robinson, and the results were reported to the appropriate military authorities.

The results of an investigation of the Santo Tomas coal field in Webb County by G. H. Ashley, have been published as Bulletin 691–I, "The Santo Tomas cannel coal, Webb County, Tex."

UTAH.

The specimens of manganese ores collected in connection with the search for war minerals in Utah have been examined mineralogically by J. T. Pardee, who has in preparation a report describing the manganese deposits of the State. Press bulletins have been issued covering these ores in central Utah, in the Tintic district, and in the Green River district.

A paper on "The Farnham anticline, Carbon County, Utah," by F. R. Clark, is now in press as Bulletin 711–A.

A comprehensive report on the "Ore deposits of Utah" (Professional Paper 111), by B. S. Butler, is in press. Progress has been made by Mr. Butler and F. C. Calkins in the preparation of a report on the Cottonwood and Park City mining districts.

Deposits of oil shale in the vicinity of Trout Creek, near the Nevada line, were examined by J. P. Buwalda, and oil shales at Devils Slide, Ogden Canyon, and Laketown, in San Pete County, and in the Uinta Mountains near Vernal were sampled by D. Dale Condit and Frank

Reeves for distillation tests. The results will appear in Bulletin 711–B. Oil-shale deposits near Ephraim were examined and sampled for analysis by Frank Reeves.

Collections of Cretaceous and Jurassic invertebrates from the southwestern part of the State were examined by T. W. Stanton.

VERMONT.

The geography of Vermont is described by Arthur Keith in a handbook on the geography of New England, which is nearly ready for publication as a bulletin of the Survey. This report, which is designed to serve as a manual for the use of the layman, as well as the teacher, is accompanied by a base map of New England on the scale of 8 miles to the inch, with the topography sketched in 250-foot contours.

The peat resources of the State are discussed by Prof. E. K. Soper in a comprehensive report on the peats of the Lake and Atlantic Coast States, with reference to their utilization as fuels and fertilizers.

General stratigraphic and areal studies in the State were practically suspended during the war.

VIRGINIA.

Information on the ground-water resources at several places in Virginia were furnished to Army and Navy officials. A special field examination and report was made by W. T. Lee and R. D. Mesler on the ground waters east of Williamsburg, between York and James rivers, for the officers at Camp Abraham Eustis. Data on the same area were furnished to the Board of Control. Information on available artesian water at the Lower Proving Ground, Machodoc Creek, Va., was supplied by T. W. Vaughan.

The site of the proposed dam to be erected across Accotink Creek at the crossing of the Southern Railway was inspected by Mr. Vaughan in compliance with a request received from the constructing quartermaster at Camp Humphreys, and an opinion was given on the nature of the foundation for the dam.

Special field studies of the Tappahannock, Morattico, Heathsville, Urbana, Kilmarnock, Williamsburg, Mathews, and Yorktown quadrangles were made by W. T. Lee, A. G. Maddren, R. D. Mesler, and W. C. Mansfield, particular attention being paid to the ground waters and to material for highway construction. The results of this field work were prepared in preliminary form, and the entire body of information was transmitted to the office of the Chief of Engineers, in compliance with a request received from his office, and was incorporated in the military map of Virginia.

The fossils obtained in connection with the areal geologic work in Virginia were identified by W. C. Mansfield and C. W. Cooke.

The physiographic features of the Coastal Plain and Piedmont provinces of the State were studied by T. W. Vaughan.

Miocene Foraminifera from Virginia are described by J. A. Cushman in Bulletin 676, and Miocene Bryozoa by F. Canu and R. S. Bassler in a bulletin being published by the United States National Museum.

Manganese deposits and the stratigraphy of the manganiferous formations in Craig, Alleghany, Shenandoah, Frederick, Pulaski, Wythe, and Bland counties were examined by G. W. Stose, F. C. Schrader, H. D. Miser, and E. F. Burchard, and a report describing the manganese belt and the more important deposits on the east side of the Shenandoah Valley, by Messrs. Stose, Miser, and Katz, has been published by the State Geological Survey, with which the work was done in cooperation. The chapter describing the mines of the belt was prepared by D. F. Hewett. Data on the manganese deposits are contained in a publication of the American Institute of Mining and Metallurgical Engineers, by E. C. Harder and D. F. Hewett.

Mr. Stose also examined salt deposits of southwestern Virginia, at the request of the State geologist.

In connection with the field examination of high-grade clays that may be suitable as substitutes for the imported clays, the clays at a number of localities in the State were examined by Prof. Heinrich Ries in company with Dr. T. L. Watson, State geologist. The results, including reports on tests of the samples, are included in a general report on the high-grade clay deposits of the United States, by Prof. Ries, now ready for submission.

Rutile deposits at Roseland, Nelson County, were studied by F. L. Hess, in cooperation with the Bureau of Mines, at the request of the War Department, and zirconiferous sands in the vicinity of Ashland, near Richmond, were examined by W. T. Schaller and A. G. Maddren with reference to their availability for military purposes.

A report on the coal area of Tazewell County, in preparation by T. K. Harnsberger was, after the resignation of the author, completed by G. H. Ashley and transmitted to the State for publication. The report on Buchanan County by Henry Hinds, forwarded to the State the previous year, has been issued by the State Geological Survey. Field work in Russell and Dickenson counties was begun in June by Chester K. Wentworth, of the Federal Survey, with whom was associated A. W. Giles for the State, the mapping being under the direct supervision of Mr. Ashley.

The peat deposits of the State are described by Prof. E. K. Soper in a general report on the peat resources of the Lake and Atlantic Coast States and their availability for use as fuel or fertilizer. A detailed description, with maps, of the peats in the Dismal Swamp district, by C. C. Osbon, is in course of publication as Bulletin 711–C.

Examinations in the field of portions of the Piedmont region were made by Laurence LaForge, and of the Valley regions by G. W. Stose, in connection with the preparation of material for use in the geographic manual of the Virginian region. A rough draft of the chapter by L. W. Stephenson covering the Coastal Plain area of Virginia, Maryland, and Delaware has been submitted. The need for special attention to military considerations being less important since the signing of the armistice, the texts for this manual are under revision with the object of making them more comprehensive and of more general interest to the layman.

WASHINGTON.

Local examinations of coal outcrops in the vicinity of Ladd, Lewis County, Wash., were made by M. R. Campbell, for the purpose of procuring data needed for the classification of the coal and the valuation of the public lands.

Quicksilver deposits in the Mount Stuart region, Kittitas County, were examined by J. T. Pardee, who also investigated a number of manganese ore deposits in the Olympic Mountains. The ores were later submitted by Mr. Pardee to mineralogic examination in the office. A report on the ores and their geology is now in preparation by Mr. Pardee. The information of special war use was promptly given to the press. Data on the deposits of manganese ore are contained in a review by E. C. Harder and D. F. Hewett of recent studies of domestic manganese deposits, published by the American Institute of Mining and Metallurgical Engineers.

Collections of Pleistocene invertebrates in the region of Puget Sound were identified by W. H. Dall.

WEST VIRGINIA.

The gas resources in the vicinity of Cabin Creek, Kanawha County, W. Va., were examined in behalf of the Navy Department by G. S. Rogers, assisted by Frank Reeves.

A report on the Abram Creek-Stony River coal field of Grant, Mineral, and Tucker counties, was completed by G. H. Ashley and submitted for publication in "Contributions to economic geology" (Bulletin 711–F).

Observations of the temperature at different depths in the Lake well, near Clarksburg, were made by C. E. Van Orstrand. This work was done in cooperation with the State geologist, who has studied the

log and cuttings from the well, which had reached the unique depth of 7,579 feet when, in the later part of June, it was abandoned as a result of caving.

The geographic features of the State have been described by M. R. Campbell and G. W. Stose in a handbook on the geography of the Virginian region, which is nearly ready for submission for publication as a bulletin.

WISCONSIN.

Some progress was made in the preparation of a paper on the Quaternary history of the Lake Superior region, by Frank Leverett.

The peat deposits of Wisconsin are discussed with reference to their possible utilization as fertilizer or fuel in a general report by Prof. E. K. Soper on the peat resources of the Lake and Atlantic Coast States. This bulletin has been submitted for publication.

Fossils of Cambrian age from a number of localities were examined by E. O. Ulrich in the course of a revision of the Cambrian faunas of the upper Mississippi Valley. These studies were conducted in cooperation with the State Geological Survey.

WYOMING.

A special investigation with detailed mapping of the leucite rock deposits of Zirkel Mesa, in Sweetwater County, Wyo., was made by H. S. Gale, and additional samples were taken with special reference to tonnage estimates of the leucite available for use in the production of potash.

Reports on the manganese deposits of the State, examined under war conditions, have been compiled by E. L. Jones, jr. The more important conclusions were promptly given to the press.

The phosphate deposits of the Wind River Range, near Lander, have been described in a manuscript transmitted by D. Dale Condit.

A discussion of the mode of occurrence of petroleum and of the prospective and possible regions of undiscovered oil fields in the State has been prepared by W. B. Emery for publication as a chapter of Bulletin 689, "The oil resources of the public-land States."

The stratigraphy, structure, and oil prospects in the vicinity of Maverick Springs, in the Wind River Basin, and near Thermopolis were examined by A. J. Collier and Harvey Bassler. Reports on oil in the Warm Springs and Hamilton domes, on the anticlines in the Maverick Springs field, and on the Big Sand Draw anticlines have been submitted for publication in "Contributions to economic geology" (Bulletin 711).

The detailed examination of the geology and structure of the Lance Creek coal field was completed by E. T. Hancock, and a report by Mr. Hancock is practically ready for submission.

Deposits of oil shale near Cookeville, Crawford Mountains, and Fossil were examined and sampled by D. Dale Condit, assisted by Frank Reeves.

Reports on collections of Carboniferous fossil invertebrates were made by G. H. Girty, on Cretaceous invertebrates by T. W. Stanton, and on Eocene fossils from the Wind River region by W. H. Dall.

A report on the "Oil possibilities in and around Baxter Basin, in the Rock Springs uplift, Sweetwater County, Wyo.," by A. R. Schultz, has been transmitted for publication as a bulletin.

In June a detailed study of the Rock River coal and oil fields was begun by E. T. Hancock, assisted by C. E. Dobbin.

CANAL ZONE.

A report on the geology and paleontology of the Canal Zone, based on investigations made in compliance with an agreement between the Panama Canal Commission, the Smithsonian Institution, and the Geological Survey, has been prepared under the general supervision of T. W. Vaughan, with the cooperation of other geologists and paleontologists of the National Museum, the New York Botanical Garden, Harvard University, and the Carnegie Institution, and published as Bulletin 103 of the United States National Museum. It includes the following papers:

On some fossil and recent Lithothamnieae of the Panama Canal Zone, by Marshall A. Howe.

The fossil higher plants from the Canal Zone, by E. W. Berry.

The smaller fossil Foraminifera of the Panama Canal Zone, by Joseph A. Cushman.

The larger fossil Foraminifera of the Panama Canal Zone, by Joseph A. Cushman.

Fossil Echini of the Panama Canal Zone and Costa Rica, by Robert Tracy Jackson.

Bryozoa of the Canal Zone and related areas, by Ferdinand Canu and Ray S. Bassler.

Decapod crustaceans from the Panama region, by Mary J. Rathbun.

Cirripedia from the Panama Canal Zone, by Henry A. Pilsbry.

Fossil corals from Central America, Cuba, and Porto Rico, with an account of the American Tertiary, Pleistocene, and recent coral reefs, by Thomas Wayland Vaughan.

The sedimentary formations of the Panama Canal Zone, with special reference to the stratigraphic relations of the fossiliferous beds, by Donald Francis MacDonald.

The biologic character and geologic correlation of the sedimentary formations of Panama in their relation to the geologic history of Central America and the West Indies, by Thomas Wayland Vaughan.

A paper by Dr. D. F. MacDonald, formerly commission geologist, in which the general geologic features and geologic resources of the Panama Canal Zone and adjacent areas are described, was submitted some time ago but has not yet been published. A large collection of fossil Mollusca made by Drs. MacDonald and Vaughan still awaits adequate investigation.

HAWAII.

The molluscan faunas of Hawaii have been the subject of systematic examination by W. H. Dall.

PORTO RICO.

An examination of the manganese deposits of Porto Rico, both developed and reported, that might be utilized as sources of manganese supply for the United States, was completed early in July by Max Roesler, who submitted an informal report for the information of the governmental organizations interested.

In compliance with a request received from the Acting Secretary of the Navy, an investigation of the ground-water resources of eastern Porto Rico between Cape San Juan and Ensenada Honda was made by T. W. Vaughan during June. He also made a geologic reconnaissance of Culebra and Vieques islands with particular reference to the ground-water resources.

VIRGIN ISLANDS.

By request of the Acting Secretary of the Navy and the governor and naval commandant of the Virgin Islands, T. W. Vaughan made geologic reconnaissances, with particular reference to ground-water resources, of the islands of St. Thomas, St. John, and St. Croix during May and June. A paper entitled "Some features of the Virgin Islands of the United States" was read by Mr. Vaughan at the Baltimore meeting of the Association of American Geographers (December, 1918), and an abstract of it is in press as a part of the forthcoming Annals of the Association.

OTHER COUNTRIES.

Canada.

In continuation of the cooperation of the United States Geological Survey with the Geological Survey of Canada, collections of invertebrate fossils from Alberta and Saskatchewan were examined and reported on by T. W. Stanton, and Pleistocene invertebrates from the Arctic coast were identified by W. H. Dall, whose report on Tertiary and Pleistocene fossils collected by the Canadian Arctic Expedition is in press as Professional Paper 125–C.

Mexico and Central America.

Mexico.—Late Tertiary invertebrates from Lower California were identified by W. H. Dall and C. Wythe Cooke. A study of Mexican Foraminifera by J. A. Cushman is mentioned below, in connection with the work in Nicaragua.

Costa Rica and Panama.—In order to procure more definite data as to the value of certain reported manganese ores in Costa Rica, arrangement was made for the examination of these deposits by J. D. Sears, whose report, with maps of the more important manganese localities, has been submitted for publication in "Contributions to economic geology" (Bulletin 710–B). The ores from Costa Rica were studied

in the office by E. L. Jones, jr. Mr. Sears also examined several manganese deposits in Panama, and the results of these studies are given in the same pamphlet.

Nicaragua.—Fossil Foraminifera from Nicaragua and Mexico are described by J. A. Cushman in a paper on the genus *Lepidocyclina* and another on the genus *Orthophragmina*, submitted for publication.

West Indies.

General.—As a product of the geologic explorations conducted in cooperation with the Carnegie Institution, the Smithsonian Institution, and the New York Botanical Garden, under the general supervision of T. W. Vaughan, a volume has been submitted to the Carnegie Institution and is now in press as Publication 291 of that institution. It contains the following papers:

Introduction, by Thomas Wayland Vaughan.
Fossil calcareous algae from the Leeward Islands, by Marshall A. Howe.
Fossil Foraminifera from the West Indies, by Joseph Augustine Cushman.
Fossil Bryozoa from the West Indies, by Ferdinand Canu and Ray S. Bassler.
Fossil Mollusca from the Leeward Islands and Cuba, by Charles Wythe Cooke.
Fossil decapod Crustacea from the West Indies, by Mary J. Rathbun.

These papers, with the exception of the one by Mr. Cooke and a little work by Messrs. Cushman and Vaughan, were prepared without expense to the Geological Survey, but this organization encouraged and so far as was practicable cooperated in their preparation.

Dominican Republic.—Certain reported deposits of chromite ore in the Dominican Republic were examined late in June and early in July, 1918, by H. G. Ferguson, and the information gathered, with reference to the practicability of procuring supplies of chromite or manganese from that region in substitution for supplies brought from remote countries, was submitted to the proper governmental authorities.

In compliance with a request from the military government of the Dominican Republic that a geologic survey of that Republic be undertaken under the scientific direction of the United States Geological Survey, T. W. Vaughan, accompanied by D. Dale Condit, C. W. Cooke, and C. P. Ross, left New York for Santo Domingo on March 24. A general geologic reconnaissance of the Republic, except the peninsula south of Samana Bay, was made during April, May, and June. Except Mr. Vaughan's salary the entire expenses of this work were borne by the Dominican Government. The mode of procedure to be followed in the survey of the Republic was planned, and collections of invertebrates were made in order to facilitate the differentiation of the formations and the determination of their age in advance of the mapping, which should follow the preparation of the necessary topographic base.

Fossils from the Dominican Republic were studied by Messrs. Cushman, Vaughan, Canu and Bassler, and Cooke.

Haitian Republic.—At the request of the civil officers of the Republic of Haiti, T. W. Vaughan in April visited Port au Prince and made arrangements for a preliminary geologic survey of Haiti, the work to be conducted under the general supervision of the United States Geological Survey.

Collections of fossils from Haiti were studied by J. A. Cushman, T. W. Vaughan, and C. W. Cooke.

Cuba.—The cooperative investigations of the principal chromite and manganese deposits of Cuba by E. F. Burchard and Albert Burch (mentioned in the annual report for 1917–18) have been described by Mr. Burchard in papers published by the American Institute of Mining and Metallurgical Engineers. These papers and a press bulletin of the Survey, subsequently translated into Spanish and published by the Cuban Bureau of Mines, have helped to call attention to the importance of exploring and developing the mineral resources of the island in general, with the result that the Cuban Government is planning a geologic survey, in which the United States Department of the Interior has assured its cooperation. Numerous data have been furnished to officials of Cuba in regard to organization, scope, and methods of geologic work, and arrangements have been made for assistance to the Cuban Government in petrologic and paleontologic studies.

A series of samples from three deep wells in Cuba, bored near the city of Cardenas, were studied in detail by A. G. Maddren, under the direction of T. W. Vaughan.

Fossils from Cuba were examined and identified by J. A. Cushman, T. W. Vaughan, and C. W. Cooke. Many fossil organisms from Cuba are described in Bulletin 103 of the United States National Museum and in Publication 291 of the Carnegie Institution of Washington.

Leeward Islands.—A number of fossil organisms from the Leeward Islands are specially described in Publication 291 of the Carnegie Institution.

Trinidad.—Valuable collections of Tertiary fossils from Trinidad were forwarded by Messrs. F. W. Penny and J. A. Bullbrook to T. W. Vaughan. These fossils were studied by Mr. Vaughan and J. A. Cushman, who prepared manuscripts on the corals and the Foraminifera.

South America.

Venezuela.—Eocene Mollusca from Venezuela have been studied and reported on by W. H. Dall and C. W. Cooke.

Peru.—A small but important collection of Eocene corals from Peru was described by T. W. Vaughan for Prof. Henry Woods, of Sedgwick Museum, Cambridge, England.

Argentina.—Collections of Tertiary invertebrates from Argentina have been under study by W. H. Dall.

DIVISION OF ALASKAN MINERAL RESOURCES.

APPROPRIATION AND CLASSES OF WORK.

Under the appropriation of $75,000 made for the continuation of the investigation of the mineral resources of Alaska the work of the Geological Survey in Alaska has been continued as far as possible. As most of the topographers and several of the geologists of the Alaska division have entered the Army or have been assigned to tasks connected with the prosecution of the war, it has not been possible to attempt to maintain all the customary work. The work of the division during the year has therefore been directed toward those tasks of special immediate importance which have included investigations of deposits of chromite and tin ore, surveys and investigations in the region that is being developed by the Government railroad, and the continuation of records of stream flow in southeastern Alaska and of mineral production throughout the Territory.

PERSONNEL.

On July 1, 1918, the personnel of the division consisted of 1 acting geologist in charge, 7 geologists, 1 topographic engineer, 1 hydraulic engineer, and 3 clerks on annual salaries, 3 geologists on per diem salaries, and 10 temporary field employees. On June 30, 1919, the personnel included 1 geologist in charge, 7 geologists, 4 topographers, 1 hydraulic engineer, 1 draftsman, and 3 clerks on annual salaries, and 9 temporary field employees.

Of the members of the division who have been engaged in active military service Lieut. Col. Alfred H. Brooks, Capt. E. M. Aten, and Lieut. George L. Harrington returned to their former positions in the Geological Survey on May 5, February 8, and April 12, respectively. Maj. J. W. Bagley and Capt. C. E. Giffin are still engaged in active military service.

FIELD WORK DURING THE SEASON OF 1918.

Areas covered and allotments.—Ten parties were engaged during 1918 in Alaska surveys and investigations. Eight of the parties were engaged in geologic surveys, one in topographic surveys, and one in stream gaging. The areas covered by reconnaissance geologic surveys on a scale of 1:250,000 (4 miles to an inch) amount to 3,500 square miles. Much of the time of the geologists was devoted to the investigation of special problems relating to the occurrence of economic minerals, the results of which can not be expressed in terms of area. About 1,200 square miles was covered by reconnaissance topographic surveys on a scale of 1:250,000 (4 miles to an inch). In cooperation with the Forest Service, stream gaging was continued in southeastern Alaska. Of the parties whose work may be classified geographically, three parties worked in southeastern Alaska, three in the Cook Inlet-Susitna region, one in the Yukon Basin, and two in Seward Peninsula.

The funds available for the fiscal year ending June 30, 1919, included the specific appropriation of $75,000 and a statutory salary of $2,000. In addition to these funds, about $15,800 of the unexpended balance of the appropriation for the year ending June 30, 1918, was used in equipping parties for the season's field work. The following tables show the allotments, including both field and office work, of the appropriation for the year ending June 30, 1919, classified by regions, by kinds of surveys, and by kinds of expenditures. In the first table the general office expenses are apportioned to the several allotments, account being taken of variations in character of work. The results are expressed in round numbers. Salaries of the permanent staff, other fixed charges, and the total allotments for the work of the Anchorage and Juneau offices are included up to the end of the fiscal year 1919, but expenses other than these include only the cost of field and office work during 1918. The "general investigations" include, among other things, the collection of mineral statistics, office work relating to the field investigations of previous seasons, and investigations under the direct administration of the geologic branch. A balance of about $16,500 is available for equipping the field parties in 1919.

Approximate general distribution of appropriations for Alaska investigations, 1918–19.

Southeastern Alaska	$15,800
Copper River and Prince William Sound	1,300
Cook Inlet and Susitna Basin	19,700
Yukon basin	8,500
Seward Peninsula	7,300
General investigations	7,900
To be allotted to field work, 1919	16,500
	77,000

Approximate allotments to different kinds of surveys and investigations, 1918–19.

Reconnaissance geologic surveys	$13,000
Special geologic investigations	17,500
Reconnaissance topographic surveys	4,300
Investigation of water resources	5,100
Collection of mineral statistics	1,800
Miscellaneous, including administration, inspection, clerical salaries, office supplies and equipment, and map compilation	18,800
To be allotted to field work, 1919	16,500
	77,000

Allotments for salaries and field expenses, 1918–19.

Scientific and technical salaries	$26,328
Field expenses	20,259
Clerical and administrative salaries and miscellaneous expenses	13,913
To be allotted to field work, 1919	16,500
	77,000

The following table exhibits the progress of investigations in Alaska and the annual grant of funds since systematic surveys were begun in 1898. It should be noted that a varying amount is spent each year on special investigations that yield results which can not be expressed in terms of area.

Progress of surveys in Alaska, 1898–1918.

Year.	Appropriation.	Areas covered by geologic surveys.			Areas covered by topographic surveys.[a]					Water resources investigations.	
		Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000).	Detailed (scale 1:62,500).	Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000; 200-foot contours).	Detailed (scale 1:62,500; 25, 50, or 100 foot contours).	Lines of levels.	Bench marks set.	Gaging stations maintained part of year.	Stream volume measurements.
		Sq. m.	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Miles.*			
1898	$46,189	9,500	.....	.....	12,840	2,070	.....	.....	.....	.....	.....
1899	25,000	6,000	.....	.....	8,690	.....	.....	.....	.....	.....	.....
1900	60,000	3,300	6,700	.....	630	11,150	.....	.....	.....	.....	.....
1901	60,000	6,200	5,800	.....	10,200	5,450	.....	.....	.....	.....	.....
1902	60,000	6,950	10,050	.....	8,330	11,970	96	.....	.....	.....	.....
1903	60,000	5,000	8,000	96	.....	15,000	.....	.....	.....	.....	.....
1904	60,000	4,050	3,500	.....	800	6,480	480	86	19	.....	.....
1905	80,000	4,000	4,100	536	.....	4,880	787	202	28	.....	.....
1906	80,000	5,000	4,000	421	.....	13,500	40	.....	.....	14	286
1907	80,000	2,600	1,400	442	.....	6,120	501	95	16	48	457
1908	80,000	2,000	2,850	604	.....	3,980	427	76	9	53	556
1909	90,000	6,100	5,500	450	6,190	5,170	444	.....	.....	81	703
1910	90,000	.....	8,635	321	.....	13,815	36	.....	.....	69	429
1911	100,000	8,000	10,550	496	.....	14,460	246	.....	.....	68	309
1912	90,000	.....	2,000	525	.....	.....	298	.....	.....	69	381
1913	100,000	3,500	2,950	180	3,400	2,535	287	.....	.....	.....	.....
1914	100,000	1,000	7,700	325	600	10,300	10	.....	.....	.....	.....
1915	100,000	.....	10,700	200	.....	10,460	12	3	2	9	.....
1916	100,000	.....	5,100	636	.....	9,700	67	.....	.....	20	.....
1917	100,000	.....	1,750	275	.....	1,050	.....	.....	.....	19	.....
1918	77,000	.....	3,509	.....	.....	1,200	.....	.....	.....	.....	.....
	1,638,189	73,200	104,785	5,507	51,680	149,230	3,731	462	74	.....	.....
Percentage of total area of Alaska	.....	12.48	17.87	0.94	8.81	25.45	0.64	.....	.....	.....	.....

[a] The Coast and Geodetic and International Boundary surveys and the General Land Office have also made topographic surveys in Alaska. The areas covered by these surveys are, of course, not included in these totals.

General work.—Alfred H. Brooks, geologist in charge of the division of Alaskan mineral resources, was engaged in military duty as lieutenant colonel of engineers, U. S. Army, and chief geologist of the American Expeditionary Forces until May 5. Since his return he has been engaged in work on problems in military geology and in the reading of referred manuscripts.

G. C. Martin, acting geologist in charge, was engaged in office work until July 26, when he started for Alaska. The time from August 12 to August 26 was devoted to a review of mining developments and

collection of statistics in the Fairbanks district. Some of the mines in the Chitina Valley were visited during the first week in September. He then spent one day in consultation with Mr. Chapin concerning the work of the office in Anchorage, and returned to Washington on September 26. In the office Mr. Martin devoted 74 days to the preparation of the progress, administrative, and statistical reports, 28 days to revision of papers and proof reading, 12 days to the preparation of the annual press bulletin, 19 days to field plans, and 108 days to administrative and miscellaneous duties. During Mr. Martin's absence in Alaska F. H. Moffit was acting geologist in charge and devoted considerable time to executive work.

During the absence of Capt. E. M. Aten on military service and since his resignation Miss Lucy M. Graves has continued as office assistant to the acting geologist in charge, and T. R. Burch has assisted in the collection and compilation of mineral statistics.

The preparation of a general summary report on the geography, geology, and mineral resources of the region tributary to the Government railroad was begun in January by S. R. Capps.

B. L. Johnson was engaged in the preparation of reports on the Prince William Sound region till January 24, when he was detailed to special work in the division of mineral resources.

Southeastern Alaska.—The investigation of the water resources of southeastern Alaska, begun in 1915 under a cooperative agreement with the Forest Service, was continued by G. H. Canfield, who maintained automatic gages throughout the year. In addition to these gages, others were installed in cooperation with individuals and corporations. This work could not have been carried on without the cordial cooperation of the Forest Service, many members of which have given substantial aid; particular acknowledgment should be made to W. G. Weigle, special agent at Ketchikan, and to Philip H. Dater, district engineer at Portland, Oreg.

A reconnaissance of the geology and mineral deposits of Admiralty Island and of the eastern part of Chichagof Island was made by Edwin Kirk. Field work was begun on May 31 and continued till August 27. An area of about 1,500 square miles was mapped on the scale of 1:200,000.

A study of the Carboniferous rocks of southeastern Alaska was assigned to George H. Girty, who studied the stratigraphy and made large collections of fossils from June 1 to July 30.

Cook Inlet and Susitna regions.—Because of the importance of the region tributary to the Government railroad and the growing demand for information concerning it, a special effort is being made to complete the mapping of that region.

A topographic reconnaissance survey of an area adjacent to the Government railroad between Talkeetna River and Broad Pass was made by D. C Witherspoon from June 20 to September 19. An area of about 1,200 square miles was mapped on a scale of 1:180,000.

A special investigation of the chromite deposits of Port Chatham and Red Mountain, on lower Cook Inlet, was made by Prof. A. C. Gill, of Cornell University, who was engaged in field work from July 1 to August 25.

Detailed investigations of the structure and coal beds in the vicinity of the Matanuska coal mines were made by Theodore Chapin throughout the summer. Mr. Chapin also collected information concerning mining in the Willow Creek, Cook Inlet, Kenai Peninsula, and Prince William Sound districts.

Yukon region.—A geologic reconnaissance survey of the Tolovana placer district was made by R. M. Overbeck, who was engaged in this work from June 18 to September 25. An area of about 2,000 square miles was mapped on the scale of 1:250,000. Mr. Overbeck also collected data on the production of placer gold in the Tolovana and Rampart districts.

The placer and lode mines of the Fairbanks district were visited by G. C. Martin from August 11 to 26 for the purpose of obtaining information concerning recent mining conditions and developments.

Investigations of the Carboniferous rocks of the upper Yukon were made by George H. Girty in August.

Seward Peninsula.—A special examination of the tin deposits of the York district was made by Edward Steidtmann and S. H. Cathcart, who devoted the time from July 5 to September 16 to this work. Studies were made of the extent, occurrence, and origin of the known tin deposits, and of the stratigraphy and structure of the rocks associated with them. An area of about 50 square miles was mapped geologically on the scale of 1:125,000 and the reconnaissance mapping of additional areas was revised.

After the end of field work in the York district Mr. Cathcart made investigations of general mining developments in Seward Peninsula. He was engaged in this work till October 28.

FIELD WORK FOR THE SEASON OF 1919.

Field work was begun before the end of the fiscal year (during May and June) by three parties, as indicated below. S. R. Capps, assisted by S. H. Cathcart, began a geologic reconnaissance survey of the upper Kantishna district. Mr. Capps was accompanied by T. P. Pendleton, who will make a topographic reconnaissance survey of the same district. J. R. Eakin and R. M. Overbeck began a topographic and geologic reconnaissance survey of the Talkeetna-Broad Pass district R. H. Sargent and G. L. Harrington began a topographic and geologic

reconnaissance survey of the Goodnews Bay district. Theodore Chapin, in addition to maintaining the branch office of the Geological Survey at Anchorage, is engaged in geologic investigations in the Matanuska coal field for the benefit of the Alaskan Engineering Commission and of the Navy Department. G. H. Canfield is continuing the investigation of the water powers of southeastern Alaska in cooperation with the Forest Service. All the surveys and investigations will continue into the fiscal year 1919–20.

ALASKA OFFICE.

The branch office of the Geological Survey at Anchorage, in charge of Theodore Chapin, was maintained throughout the year. The main purpose of this office is to provide the means of close cooperation between the Geological Survey and those in charge of the operation of the Government coal mines in the Matanuska Valley. It is also the purpose of the resident geologist to do everything possible to aid the mining industry in the region tributary to the Government railroad, to keep in close touch with all local developments in mining and prospecting, and to furnish whatever aid may be rendered by giving information, advice, and publications to all who are engaged in mining and prospecting.

COLLECTION OF STATISTICS.

The collection of statistics of production of metals in Alaska, begun by the Alaska division in 1905, was continued as usual. Preliminary estimates of mineral production for 1918 were published on January 1, 1919.

PUBLICATIONS.

During the year the Survey published two professional papers (Nos. 109 and 120–D), and five bulletins (Nos. 662, 664, 668, 683, and 687) relating to Alaska. Nine topographic maps (Juneau and vicinity by D. C. Witherspoon, scale 1:24,000, contour interval, 50 feet; Pls. I, III, IV, and V, Professional Paper 109; Pl. I, Bulletin 668; Pls. I and II, Bulletin 683; and Pl. I, Bulletin 687) were published during the year.

One bulletin (No. 692) was in press at the end of the year.

Manuscripts of the following reports are completed:

Bulletin 682. Marble resources of southeastern Alaska, by E. F. Burchard and Theodore Chapin.

Bulletin 699. The Porcupine district, Alaska, by H. M. Eakin.

A geologic reconnaissance in the northern part of the Yukon-Tanana region, Alaska, by Eliot Blackwelder.

The geology and mineral resources of Latouche and Knight Island districts, Alaska, by B. L. Johnson.

The Port Valdez and Jack Bay district, Alaska, by B. L. Johnson.

The western Talkeetna Mountains, Alaska, by S. R. Capps.

Chromite of Kenai Peninsula, by A. C. Gill.

The geology of the Cape York tin deposits, by Edward Steidtmann and S. H. Cathcart.

A geologic reconnaissance of part of the Tolovana-Hess River district, by R. M. Overbeck.

The following reports are in hand:

Geology of the Glacier Bay and Lituya region, Alaska, by F. E. Wright.

Geology of the region along the international boundary from Porcupine River to the Arctic Ocean, by A. G. Maddren.

The upper Matanuska basin, by G. C. Martin.

The Yakataga district, Alaska, by A. G. Maddren.

The Mesozoic stratigraphy of Alaska, by G. C. Martin.

The Kotsina-Kuskulana district, by F. H. Moffit.

The lower Kuskokwim region, by A. G. Maddren.

The Ruby-Kuskokwim region, Alaska, by J. B. Mertie, jr., and G. L. Harrington.

The Cretaceous and Tertiary floras of Alaska, by Arthur Hollick.

The Juneau district, Alaska, by A. C. Spencer and H. M. Eakin.

The Ketchikan district, Alaska, by Theodore Chapin.

The Seward-Fairbanks route, by S. R. Capps.

The geology of parts of Admiralty and Chichagof islands, by Edwin Kirk.

Office work on the maps listed below has been completed:

Kotsina-Kuskulana district, by D. C. Witherspoon; scale, 1:62,500; contour interval, 100 feet.

Lower Kuskokwim region, by A. G. Maddren; scale, 1:500,000; contour interval, 400 feet.

Ruby district, by C. E. Giffin and R. H. Sargent; scale, 1:250,000; contour interval, 200 feet.

The following topographic maps are in hand:

Innoko-Iditarod region, by R. H. Sargent and C. E. Giffin; scale, 1:250,000; contour interval, 200 feet.

Anchorage-Matanuska region, by J. W. Bagley and others; scale, 1:250,000; contour interval, 200 feet.

Yukon-Tanana Valley; compiled; scale, 1:500,000; contour interval, 400 feet.

Glacier Bay region; compiled; scale, 1:250,000; contour interval, 200 feet.

Port Wells region, by J. W. Bagley; scale, 1:250,000; contour interval, 200 feet.

Jack Bay district, by J. W. Bagley; scale, 1:62,500; contour interval, 50 feet.

Fidalgo-Gravina district, by D. C. Witherspoon; scale, 1:250,000; contour interval, 200 feet.

Susitna-Chulitna district, by D. C. Witherspoon; scale, 1:250,000; contour interval, 200 feet.

Seward-Fairbanks route; compiled; scale, 1:250,000; contour interval, 200 feet.

DIVISION OF MINERAL RESOURCES.

The staff of the division of mineral resources during the fiscal year 1918–19 comprised 35 geologists and engineer specialists, of whom 16 devoted essentially their entire time to the work of the division, the remainder dividing their time with the division of geology or with the division of chemistry and physics. The clerical and statistical force numbered 48, all of whom devoted full time to work on

mineral resources. Most of the members of this staff were employed in Washington, but branch offices were maintained in Denver, Salt Lake City, and San Francisco, as stated on page 585. The work of the division was conducted essentially upon a war basis from July to December, inclusive, and was readjusted to the peace-time basis in January. By order of the Director, dated January 2, 1919, Edson S. Bastin was designated as geologist in charge of the division, in place of H. D. McCaskey. Mr. McCaskey, who had continued his administrative duties throughout the war at considerable personal sacrifice and detriment to his health, was, at his own request, relieved of administrative duties, though retaining his connection with the division in an advisory capacity and for the pursuance of special investigations. G. F. Loughlin was relieved of his duties as geologist in charge of the section of nonmetals and placed in charge of the section of metals, the duties of the latter position having been carried previously by Mr. McCaskey in addition to his duties as chief of the division. A new section on mineral fuels was organized and placed in charge of C. E. Lesher. R. W. Stone was placed in charge of the section of nonmetals except fuels. A new section on foreign mineral deposits was created to continue and expand the work on foreign mineral resources which had been carried on during the last year of the war in preparation for the Peace Conference. J. B. Umpleby was placed in charge of this section.

Other changes in the personnel during the year included the resignation, effective February 8, of J. D. Northrop, for a number of years in charge of the statistical work on petroleum, natural gas, natural-gas gasoline, and asphalt. Mr. Northrop was succeeded by E. Russell Lloyd, who was transferred from the division of geology, and on May 22 E. G. Sievers was appointed to conduct the statistical work on natural gas and natural-gas gasoline, under Mr. Lloyd's general supervision. G. W. Stose relieved J. M. Hill of the work of specialist in charge of barytes and strontium.

The section of cooperation, in charge of Mr. Bastin, discontinued on January 2 under the order of reorganization, had been active from July until after the armistice in supplying information on mineral matters to other Government departments, particularly the military establishments and war boards. After July a large share of this cooperative work was directed by F. J. Katz, Mr. Bastin having been assigned by the Survey as mineral adviser to the Bureau of Research of the War Trade Board, an assignment resulting in fuller utilization of the mineral information of the Survey in all matters relating to foreign trade. The weekly statistics of production of copper, lead, zinc, and aluminum were furnished for the guidance of the Government purchasing agencies until January, 1919. A system of monthly reports covering the raw mineral materials of chief war

importance was established, beginning in June, 1918, with the issuance of diagrams showing graphically the available supply of each mineral month by month. These were replaced in September by a series of monthly mimeographed tables showing not only the supplies made available during the month but the estimated requirements from various sources during the remainder of the calendar year. These tables were prepared by the Survey in cooperation with the War Industries Board and the mineral specialists of the Shipping Board and were supplemented in October by a mimeographed monthly bulletin, also prepared cooperatively, reviewing the situation for a number of war minerals. Two numbers of this monthly bulletin were issued and were widely distributed within the Government departments. The establishment of this thorough system of regular monthly reports covering the mineral commodities of greatest war importance during October and November shows that in war management of mineral resources, as in so many other lines of war activities, the country had just about struck its gait at the time Germany yielded. The division of mineral resources also assisted during the months of July to November in the work of the Capital Issues Committee in the Treasury Department. By contributions of geologic information and by the judgment of its experienced specialists it aided this committee in directing capital into the fields of maximum usefulness under a war régime.

During the year the division also contributed reports on mercury, graphite, phosphate rock, manganese, antimony, tungsten, magnesite, emery and corundum, bauxite and aluminum, and platinum to a series of mimeograph pamphlets issued as Interior Department publications, under the direction of J. E. Spurr of the Bureau of Mines. These pamphlets dealt with the political and commercial control of these commodities throughout the world and were widely circulated among Government departments. Specialists of the division also contributed chapters on mineral commodities to reports on economic conditions in Japan and Sweden, prepared by the Bureau of Research of the War Trade Board.

The work of the section of cooperation was closely linked with the activities of the Joint Information Board on Minerals and Derivatives, of which Mr. Bastin was executive secretary and Mr. Katz assistant secretary. This informal interdepartmental board, representing 36 divisions and bureaus in the Government, was organized in February, 1918, to insure a better coordination and a minimum of duplication among bureaus and boards concerned with mineral matters and to provide a broader channel for the exchange of mineral information. Under the chairmanship of Pope Yeatman, of the War Industries Board, this information board performed a useful service, although handicapped by the failure of certain branches of the War Industries

Board to cooperate fully in its activities. As the war activities of the Government in minerals became better organized and more fully understood by all concerned the need for the information board declined, and between July 1 and the date of the armistice only two meetings were held, these being devoted to the nitrate and petroleum situations. A voluminous index of the mineral information in the possession of several Government organizations was compiled and was published in mimeograph form through the cooperation of the Central Bureau of Planning and Statistics in October. The Joint Information Board formally went out of existence on January 1, 1919, its records being deposited with the division of mineral resources of the Geological Survey.

The cooperation between the division and the Fuel Administration in the collection of statistics of the coal and coke industries, begun in October, 1917, was continued throughout the year. Through this cooperation the scope of the statistical work was greatly enlarged and the basis of frequency increased from annual to weekly and daily. This work was in charge of C. E. Lesher, who served in the dual capacity of geologist in charge of coal and coke statistics for the Survey and director of the bureau of statistics in the Fuel Administration. Mr. Lesher was assisted by W. T. Thom, jr. The result of this cooperation has been the accumulation of a vast fund of information on the production, distribution, consumption, and stocks of coal in the United States in 1917, 1918, and 1919, in a degree of detail and a frequency interval that would not have been possible with the limited Survey staff. Most of the detailed information will be published by the Fuel Administration, but the volumes of Mineral Resources will contain summaries of the more essential data. The staff employed in the busiest period in this cooperative work numbered about 450, as against 6 employed by the Survey prior to the war, the additional force being carried on the appropriation of the Fuel Administration. After the armistice the work of the Fuel Administration was gradually curtailed, and on June 30, 1919, it ceased entirely. A by-product of the cooperative work of the Fuel Administration was a report by Mr. Lesher on the history of coal prices during the war, contributed to a series of price studies compiled by the War Industries Board.

The increased frequency with which statistics of many of the mineral industries were obtained during the war had many obvious advantages, even for peace times. Monthly statistics of petroleum production had been begun in 1917, even before the United States entered the war, and will be permanently continued. The issuance of the weekly coal report could not be continued beyond the end of the fiscal year by the Survey's staff alone, but through the aid of clerical and other cooperative assistance obtained from the National

Coal Association its continuance is assured for several months at least, and it is hoped that the work may be made permanent. The weekly statistics of production of copper, lead, zinc, and aluminum collected during the war were never made public, but were obtained solely for the guidance of Government purchasing agencies. A special campaign of correspondence, undertaken after the armistice, to determine whether the industries concerned would cooperate with the Survey in the continued collection of these statistics on a monthly basis for publication showed that many of the larger producers did not desire the publication of such monthly statistics of production, although some were willing that they should be published, provided monthly statistics of consumption were also made public. On January 1, therefore, the statistics for these metals reverted to an annual and semiannual basis.

As for many years past, the division of mineral resources continued to maintain three branch offices in the mining States in the West, with the dual purpose of collecting statistics of mine production of gold, silver, copper, lead, and zinc with greater expedition and accuracy than is possible from Washington and of making Survey information more readily and quickly available to the mining interests of these communities. The personal contact between the technical men in charge of these offices and the mining men of their districts greatly facilitates the Survey work. The offices at Denver, Salt Lake City, and San Francisco are in direct charge of C. W. Henderson, V. C. Heikes, and C. G. Yale, respectively. In the Denver office are prepared the mine reports for South Dakota, Wyoming, Colorado, and New Mexico; in the Salt Lake City office the reports for Montana, Idaho, Washington, Utah, Nevada, and Arizona; and in the San Francisco office the reports for California and Oregon.

The work of compiling atlases and accompanying texts and card indexes showing the mineral production and resources of foreign countries carried on during the war by a group of Survey geologists in cooperation with the Department of State and in preparation for the Peace Conference, was, by the Director's order of January 2, placed on a permanent peace basis by the creation of the section of foreign mineral deposits under the continued guidance of J. B. Umpleby. Prior to the reorganization the following Survey geologists were engaged, for the major part of their time, on various phases of this work: Adolph Knopf, A. C. Spencer, H. G. Ferguson, S. R. Capps, Max Roesler, Eugene Stebinger, Miss E. F. Bliss, and Miss D. Monical. W. C. Alden and W. T. Lee were also associated with this work for brief periods. The staff, after the reorganization, included Mr. Stebinger, Mr. Roesler, B. L. Johnson, G. C. Martin, and Miss Monical. The organization of this work on a permanent basis was undertaken in recognition of the rapidly growing interest

of Americans in the development of trade with foreign countries and in investment in foreign mining enterprises and from a realization born of the war of the importance of certain foreign resources in our own domestic economy. Prior to the armistice the information collected had been kept confidential, but after the armistice most of it was made available to American capitalists and engineers interested in foreign mineral deposits by placing it in open files whose availability was widely advertised to the mining profession. At the same time mining men were urged to aid in the work of further compilation by making available to the Survey the unpublished reports of their engineers and geologists. Cooperation with the mining profession thus begun is proceeding satisfactorily, and this pooling of information from many sources will prove of inestimable benefit not only to the Government but to American commercial interests. A plan of organization in the section of foreign mineral deposits includes the assignment of each continent to a specialist; the exception is the assignment of coal and oil from all continents to one specialist because of the particular problems involved. Much information is now in hand for all continents, and atlases showing the mineral reserves of Europe and Latin America have been completed though not yet published. The world atlas of production has also been completed and during the last months of the fiscal year was being prepared for publication. The work of the section will be published only in part in the chapters of Mineral Resources of the United States; more of the material will be issued as bulletins and separate atlases with accompanying texts.

The work relating to foreign mineral resources is not confined, however, to this section. For many years the chapters of Mineral Resources have contained tables of world production for certain commodities and have reported various foreign developments of interest to American producers. In most of the reports for the calendar year 1918 much more attention has been devoted to foreign production and developments and resources than ever before, and the assembling of information on foreign deposits by the commodity specialist will proceed simultaneously with the studies of the continent specialist, each group strengthening the other.

In April, 1919, under the auspices of the foreign trade advisers of the Department of State, the Economic Liaison Committee was organized, comprising a representative of each Government department concerned in any important degree with foreign trade matters. The purpose of this committee has been to focus on certain foreign trade problems the expert knowledge of specialists in various Government departments, thus promoting harmonious and well-considered action among all the departments concerned. The division of mineral resources, through Mr. Bastin, its representative on this com-

mittee, and through a number of its specialists, shared largely in the work of the committee, particularly in the activities of its subcommittee on mineral raw materials, of which Mr. Bastin is chairman. The function of this subcommittee has included the formulation of recommendations as to governmental policy toward the exporting of coal and the acquisition of foreign petroleum resources, and these recommendations constitute a notable step toward the adoption of a definite governmental policy upon these important questions.

During the fiscal year preliminary arrangements were completed for cooperation with the Bureau of the Census in taking the census of mineral production for the calendar year 1919. The plans contemplate a full utilization of the knowledge and experience of the division of mineral resources in this work, including the activities not only of the Washington staff but of the Western branch offices.

The unavoidable delay in the publication of the final bound volumes of Mineral Resources of the United States, which must wait upon the completion of the slowest chapter, has been a serious inconvenience to business men, economists, and others who are interested in our mineral industries in the aggregate as well as in detail. It was therefore decided to begin in 1919 the preparation of a summary report on the mineral resources of the United States, to be issued in a preliminary edition as early as possible after the end of the year. The first one of these pamphlets, issued on August 8, 1919, consists almost wholly of tables giving the more essential statistical facts concerning all the mineral products of the United States. A brief review of the more significant features of the mineral industry during 1918 forms the only text accompanying the tables. It is hoped that this small pamphlet will be a timely and convenient reference book for mining men and the business public in general, and its statistics will be found to be only slightly revised in the final report.

Cooperation between Federal and State surveys was continued during 1918, including 18 States—Alabama, Florida, Georgia, Illinois, Iowa, Kansas, Maryland, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Virginia, Washington, and Wisconsin. This cooperation obviates the necessity of separate statistical campaigns by State officials, thus effecting material saving to the States, obviating annoyance to producers by duplicate requests for the same data, and insuring a better grade of service.

DIVISION OF CHEMICAL AND PHYSICAL RESEARCH.

The personnel of the division of chemical and physical research includes one geologist, nine chemists, two physicists, one clerk, two laboratory helpers, and one laborer. Dr. George F. Becker, geologist,

was in charge of the division until his death on April 20, 1919, and since that date George Steiger, chief chemist, has been acting in charge.

The work in chemistry is in charge of Mr. Steiger, and that in physics is under the supervision of C. E. Van Orstrand, physical geologist. Two members of the division resigned during the year—Benedict Salkover, junior chemist, on April 15, and M. A. Crews, laboratory aid, on May 1. J. G. Fairchild was appointed assistant chemist beginning July 1, 1919. E. T. Erickson was appointed junior chemist August 29 in order to assist in the examination of potash samples.

Normally the work in chemistry consists of (1) qualitative and quantitative analyses and mineralogic determinations of rocks and minerals collected by geologists; (2) the identification by inspection or simple tests of specimens received at the Survey from outside parties and the drafting of replies to correspondence from similar sources; and (3) researches or studies relating to various geochemical and mineralogic problems with which the geologists of the Survey are concerned. Research work of the ordinary type was practically suspended during the war. Time formerly allotted to such work was given to economic studies and to cooperation with the division of mineral resources.

During the year 1,499 chemical analyses were made, 607 of which were qualitative tests, 484 (including 111 platinum assays) were assays of ores, 145 were analyses of potash-bearing rocks, salts, and brines, 164 were for valuation as nitrate samples, and the remaining 99 were primarily for scientific use.

The search for domestic supplies of platinum, resulting from scarcity of the metal and unprecedented prices, caused an unusual demand on the Survey for platinum assays. Accordingly a furnace was installed, and 111 rocks were tested for platinum. Potash also continued of prime importance, and much of the energy of the laboratory was devoted to potash determinations. Special consideration of the production of potash was given by W. B. Hicks, who supervised the collection of statistics as to the sources and amounts of potash produced. Mr. Hicks made field trips to the experimental plants of the Atlantic Potash Co. at Stockertown, Pa., and of the Dexter Portland Cement Co. at Nazareth, Pa., and spent three months studying the potash-bearing alkali lakes of western Nebraska and the plants for extracting potash from them. The samples collected by Mr. Hicks have been analyzed, and the results are in preparation for publication.

Many of the mica localities in the Eastern States were visited by W. T. Schaller, who, in connection with the collection of statistics of consumption and production of mica, studied the methods of produc-

tion as well as the sources of raw materials. The information thus gathered was especially helpful to the mica section of the War Industries Board. A promising locality for monazite in North Carolina was examined by Mr. Schaller, who also made field studies of zircon districts in New Jersey and Virginia and prepared reports on them for the use of the War Industries Board and the War Department. Statistics of the production, available amounts, and consumption of industrial gem minerals were compiled by Mr. Schaller in connection with the preparation of the annual report on gems in the United States.

Aside from the regular chemical investigations R. C. Wells devoted considerable time to the preparation of the annual report on sodium and sodium compounds. Several industrial works producing sodium salts were visited and studied; producers, manufacturers, and consumers of these salts were consulted; and the information was made public. The remainder of Mr. Wells's time was devoted to work in physical chemistry, with special reference to the study of the hydrogen ion concentration of natural waters. Late in the year he visited the Marine Laboratory of the Carnegie Institution at Tortugas, Fla., at the request of that institution, for the purpose of making some chemical determinations of sea water, the results of which are to be used in studies now in progress in the Survey.

The disintegrating effect of nitric acid of different degrees of strength and under various conditions on a number of samples of rock submitted by the Navy Department was the subject of a series of experiments by George Steiger. The samples were tested to determine their availability for lining nitric acid towers, and the results of the special tests were reported to the Navy Department.

Observations of the temperatures at different depths in deep wells in Texas, Oklahoma, and West Virginia, were made by C. E. Van Orstrand, who completed an elaborate series of temperature observations at the Lake well near Fairmont, W. Va., where a temperature of 168.6° F. was recorded at a depth of 7,500 feet. In this well, the deepest in the world, the temperature has been taken at a depth greater than at any other point, exceeding by 215 feet the point of deepest temperature observation in Germany. To facilitate the observation of temperatures at such great depths Mr. Van Orstrand has designed and constructed a device for measuring the depths of wells by means of the sand line. His instrument has proved superior in most respects to the steel tape now in general use in the oil fields. A report summarizing the results of all recent observations of deep earth temperatures is in preparation by Mr. Van Orstrand.

Some applications of the kinetic theory of matter to special geophysical problems, such as the evaluation of the mass of helium in the earth's atmosphere, were made by Mr. Van Orstrand.

In the connection with the studies of the depreciation of oil and gas fields, conducted in cooperation with the Bureau of Internal Revenue of the Treasury Department, samples of oil sand were collected at many localities by A. F. Melcher and several geologists of the Survey. Porosity determinations of 33 samples were made by Mr. Melcher, who completed the preparation of a report on porosity determinations and their application to some of the problems in oil and gas geology.

Progress in the preparation of a table of the exponential function was made by M. A. Crews.

During a portion of the year G. F. Becker was engaged in theoretical investigations relative to interstitial space in rocks.

A recalculation of atomic weights, incorporating data of recent determination, was made by F. W. Clarke, chairman of the International Committee on Atomic Weights, and the manuscript of the work has been submitted to the Smithsonian Institution for publication. The reports of the International Committee on Atomic Weights having been suspended on account of the war, a manuscript for the 1919 report, including determinations made since the last report, has been completed by Professor Clarke and submitted for the approval of the French and English members of the committee.

During the year one bulletin, four chapters of Mineral Resources, and five scientific papers by members of the division have been printed in official or unofficial publications. One bulletin, one Smithsonian miscellaneous report, one professional paper, and one report for unofficial publication, the manuscripts of which have been completed, are awaiting publication.

Among the more notable reports prepared by the chemists and physicists during the year are papers by F. W. Clarke on "Inorganic constituents of marine invertebrates" (a revision and enlargement of Professional Paper 102), on the "Data of geochemistry" (fourth edition), and on a "Recalculation of atomic weights"; by F. W. Clarke and George Steiger on "Inorganic constituents of lobster shells"; by George Steiger on the "Precipitation of zirconium phosphate"; by George Steiger and T. L. Watson on "Titanium corundum spinellite"; by W. T. Schaller on "Plancheite and shattuckite, copper silicates"; by R. C. Wells and R. V. A. Mills on the "Evaporation and concentration of waters associated with petroleum and natural gas" (Bulletin 693); by W. B. Hicks on a "Review of the domestic potash industry"; and the reports on the production of mica, sodium salts, and potash in 1917, prepared by Messrs. Schaller, Wells, and Hicks, respectively, for publication in the annual volume of Mineral Resources. H. S. Gale is joint author of the potash report.

TOPOGRAPHIC BRANCH.

ORGANIZATION.

The organization of the topographic branch during the year was as follows:

Chief geographer, R. B. Marshall.

Northeastern, southeastern, central, and eastern departments, W. H. Herron and T. G. Gerdine, geographers in charge.

Western department, G. R. Davis, geographer in charge.

Inspectors of topography, W. M. Beaman, topographic engineer, in charge, A. M. Walker, topographic engineer; L. S. Leopold, topographer.

PERSONNEL.

Of the 113 members of the topographic branch who had received commissions in the Engineer Officers' Reserve Corps at the end of the fiscal year 71 had been reinstated in their former positions, including the chief geographer, 4 geographers, 31 topographic engineers, 2 topographers, 25 assistant topographers, 2 junior topographers, 1 draftsman, and 5 field assistants, and 42 were still attached to the Army. The technical force was also increased by the reinstatement of 1 junior topographer and the appointment of 9 and the reinstatement of 1 draftsman and was reduced by the transfer of 2 topographic engineers and the death of 1, the resignation of 1 topographer, the transfer of 1 assistant topographer and the resignation of 3, the resignation of 1 junior topographer and the death of 1, and the resignation of 9 draftsmen and the transfer of 2. In addition 2 draftsmen were detailed to the geologic branch. With these changes the corps now includes a chief geographer, 9 geographers, 45 topographic engineers, 7 topographers, 29 assistant topographers, 22 junior topographers, and 20 draftsmen—a total of 135. One assistant topographer was on furlough during the year. In addition 84 technical field assistants were employed during the whole or a part of the fiscal year. All the Engineer Reserve officers who were detailed from the War Department to the topographic branch during the period of the war to assist in topographic mapping and for training have been returned to the War Department. The clerical force comprises 14 clerks of various grades. One clerk was on furlough during the year.

PUBLICATIONS.

The published work of the topographic branch for the fiscal year consists of 180 published maps, a reprint of the book of Topographic Instructions, with additions and corrections, 4 new bulletins, and reprint of 2 bulletins, 514 and 551. A revision of Bulletin 226, "Boundaries of the United States," has been commenced. Manuscript containing results of triangulation and primary traverse of

the United States for the years 1916, 1917, and 1918 has been transmitted for publication as Bulletin 709.

ALLOTMENTS.

The total appropriations for topographic surveys for the fiscal year 1919 were as follows:

Topographic surveys	$142,196.00
Surveying national forests	74,219.60
Statutory salaries	9,200.00
Special funds for military mapping (contributed by War Department)	385,000.00
	610,615.60

COOPERATION.

Cooperation has been maintained in only five States, which contributed the following amounts, with the understanding that they were to be used in connection with the military surveys, to which the topographic branch devoted all its activities until the armistice:

California	$14,000
Kentucky	10,000
Maine	5,000
Virginia	4,000
Washington	10,500
	43,500

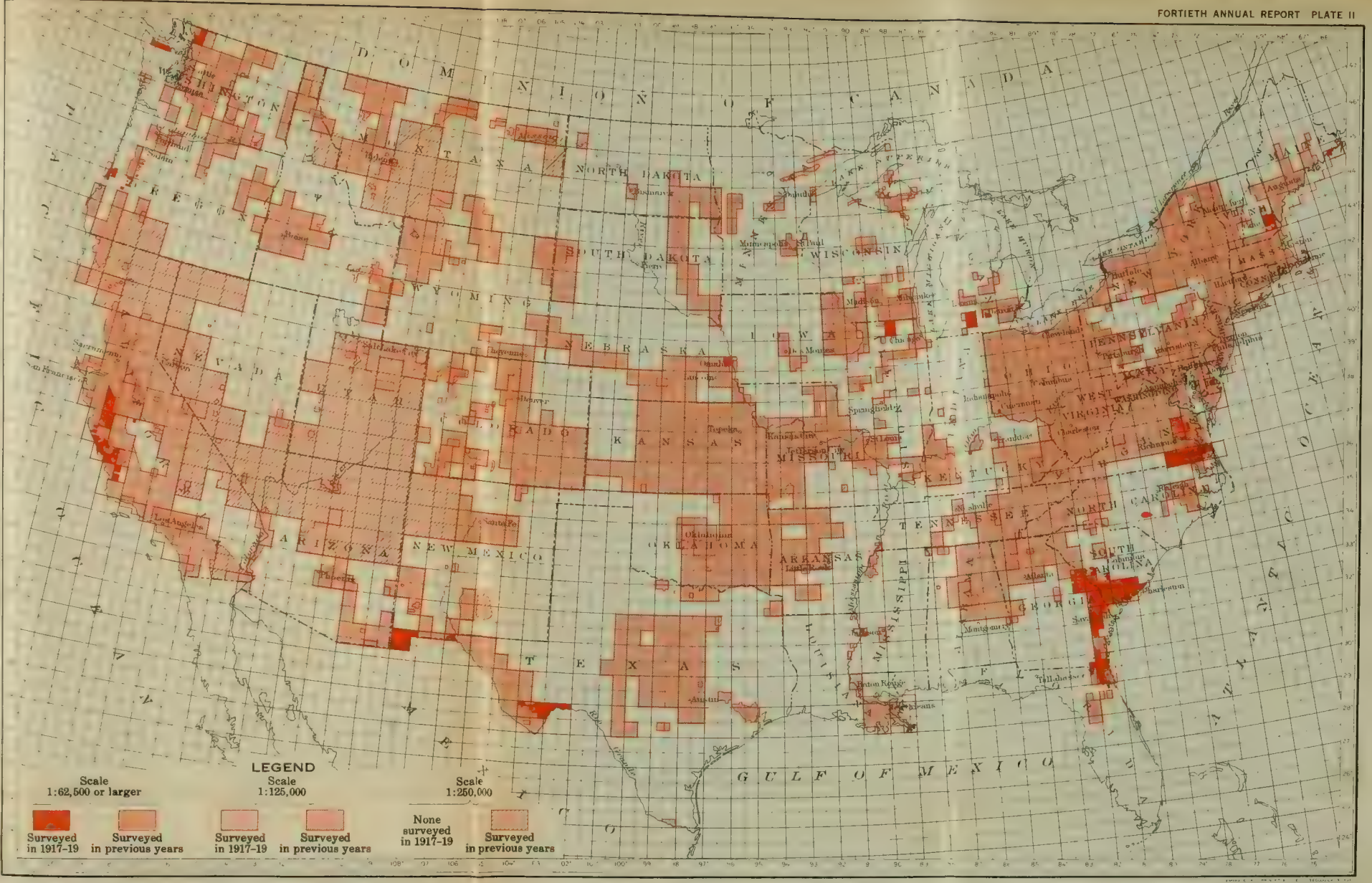
An additional allotment of $1,060 was made by the State of Arizona for cooperation in the compilation of the Arizona portion of the international map of the world, scale 1:500,000, the remainder of the expense to be met from Federal funds.

The following amounts were contributed by the States named below, for work in the spring of 1919, with the understanding that an equal amount be expended by the United States Geological Survey when Federal funds became available. This work was cooperative with the States but not with the War Department.

Idaho	$5,000.00
Illinois	7,000.00
Iowa	3,000.00
Michigan	14,866.67
Pennsylvania	5,000.00
Vermont	3,000.00
West Virginia	1,109.43
Wisconsin	20,000.00
	58,976.10

SUMMARY OF RESULTS.

Practically all the funds available for topographic mapping were allotted to areas selected by the War Department for special military surveys. As shown in the following tables, the new area mapped was 10,068 square miles, making the total area mapped in the



AREAS COVERED BY TOPOGRAPHIC SURVEYS MADE BY UNITED STATES GEOLOGICAL SURVEY PRIOR TO JULY 1, 1919

AND THE SCALE EMPLOYED FOR EACH AREA

Scale 1:6000000

100 0 100 200 300 400 500 Miles

United States at the end of the fiscal year 1,289,958 square miles, or 42.6 per cent of the entire country. (See Pl. II.)

In connection with these surveys 4,206 linear miles of primary and precise levels were run and 1,420 permanent bench marks were established, making 278,162 miles of primary and precise levels run since the authorization of this work by Congress in 1896.

Primary traverse lines aggregating 4,217 miles were run, in connection with which 611 permanent marks were set.

Triangulation stations to the number of 61 were occupied, and 50 were permanently marked.

Present condition of topographic surveys of the United States and new area surveyed July 1, 1918, to June 30, 1919.

	New area mapped July 1, 1918, to June 30, 1919.	Total area mapped to June 30, 1919.	Percentage of total area of State mapped to June 30, 1919.
	Sq. miles.	*Sq. miles.*	
Alabama		19,192	37
Arizona		70,136	62
Arkansas		21,494	40
California	840	123,348	78
Colorado		50,980	49
Connecticut		4,965	100
Delaware		2,370	100
District of Columbia		70	100
Florida		4,716	7
Georgia	3,166	24,673	41
Idaho		28,196	33
Illinois	112	16,907	29
Indiana		3,609	10
Iowa		11,916	21
Kansas		64,159	78
Kentucky	71	18,165	45
Louisiana		8,366	17
Maine	178	10,297	31
Maryland		12,327	100
Massachusetts		8,266	100
Michigan	273	9,358	16
Minnesota		7,354	9
Mississippi		2,126	4
Missouri		36,913	53
Montana		58,511	40
Nebraska		27,117	35
Nevada		51,141	46
New Hampshire	10	4,133	44
New Jersey		8,224	100
New Mexico		42,588	34
New York		44,663	91
North Carolina	327	18,876	36
North Dakota		9,814	14
Ohio		41,040	100
Oklahoma		39,908	57
Oregon	515	25,235	26
Pennsylvania	93	25,229	56
Rhode Island		1,248	100
South Carolina	2,480	11,826	38
South Dakota		19,032	25
Tennessee		21,283	50
Texas		73,384	28
Utah		69,025	82
Vermont	103	4,576	47
Virginia	1,416	35,750	83
Washington	410	30,464	44
West Virginia		24,170	100
Wisconsin	74	12,775	23
Wyoming		30,043	31
Total United States (exclusive of Alaska)	10,068	1,289,958	42.6
Hawaii		1,393	

NOTE.—For Alaska surveys see p. 575-581.

GENERAL OFFICE WORK.

Results of computations for vertical and horizontal control were copied and catalogued.

The computations of control data were made principally by D. H. Baldwin, F. J. McMaugh, E. C. Bebb, C. F. Urquhart, G. T. Hawkins, J. B. Metcalfe, jr., A. C. Roberts, A. T. Fowler, Jacob Lenovitz, G. Risegari, D. T. McNair, Harold Dewhirst, W. E. Trimble, A. W. Phelps, C. A. Hahn, C. L. Nelson, and G. E. Mills, under the immediate supervision of E. M. Douglas, geographer. S. S. Gannett, geographer, was engaged in preparing manuscript and compiling data for bulletins submitted for publication and in miscellaneous computations.

J. H. Renshawe, geographer, was engaged during the year in preparing shaded relief maps of southern California, southwestern Arizona, Great Falls of the Potomac and vicinity, and the Black Hills, South Dakota-Wyoming; and also, upon request of agencies engaged in work for the Peace Commission, relief maps of southwestern Russia and regions south, between the Baltic and Black seas, including Poland, Ukrainia, Rumania, and the Crimea.

INSPECTION OF TOPOGRAPHIC MAPPING.

W. M. Beaman, assisted by L. S. Leopold, spent the entire year in the office in general supervision of the preparation of all results of military surveys for engraving, photolithography, or other reproduction. A. M. Walker returned from foreign service and assisted in this work from March to June. Mr. Beaman was also in charge of the reports giving confidential military information submitted to the War Department.

DRAFTING.

The compilation of the United States portion of the international map of the world, under the immediate supervision of A. F. Hassan, was discontinued for the greater part of the year in order that the drafting force might be utilized in drafting the military topographic maps. During the year the force was decreased from 33 to 20 draftsmen.

In addition to 82 topographic maps and 69 accompanying military-information tracings completed during the year, a map of the United States showing the location of military activities and a large wall map of the world in colors for the Shipping Board were prepared. The compilation of the base of the Arizona portion of the international map was undertaken in cooperation with that State, and about 65 per cent of it was completed.

From May, 1918, to February, 1919, detachments of the enlisted personnel of the Four hundred and seventy-second Engineers were detailed to the Geological Survey for training in topographic map

drafting. Upon completing their training they assisted in the drafting of the military maps in this office or were assigned to similar duty in other offices. In all about 100 men reported for instruction, a notable contribution to the war program.

NORTHEASTERN DEPARTMENT.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Maine, New Hampshire, and Vermont. This work comprised the completion of the survey of 2 quadrangles, in addition to which 2 quadrangles were partly surveyed. The total new area mapped was 291 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. In connection with this work 5 miles of primary levels were run and 1 permanent bench mark was established.

Triangulation was carried on by one party in Vermont, 8 stations being occupied and 3 marked.

Topographic surveys in northeastern department from July 1, 1918, to June 30, 1919.

State.	Contour interval.	For publication on scale of 1:62,500 (new).	Primary levels.		Triangulation.	
			Distance run.	Bench marks.	Stations occupied.	Stations marked.
	Feet.	*Sq. mi.*	*Miles.*			
Maine	20	178				
New Hampshire	20	10				
Vermont	20	103	5	1	8	3
		291	5	1	8	3

Maine.—For the continuation of cooperative topographic surveys in Maine the Public Utilities Commission allotted $5,000 and the United States Geological Survey allotted an equal amount, the amount necessary to complete the surveys being paid from Federal funds. The survey of the Columbia Falls and Great Wass Island quadrangles, in Washington County, was completed by W. H. Griffin, Olinus Smith, and P. A. Power, the total area mapped being 178 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet.

New Hampshire.—The survey of the Suncook quadrangle, in Merrimack, Rockingham, and Hillsboro counties, N. H., was begun by Olinus Smith, the total area mapped being 10 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet.

Vermont.—In the spring of 1919 the State geologist of Vermont allotted $3,000 for cooperative topographic surveys in Vermont, with the understanding that an equal amount would be expended by the United States Geological Survey when Federal funds became

available. The survey of the Waitsfield quadrangle, in Washington and Addison counties, was continued by Hersey Munroe and R. L. McCammon, the total area surveyed being 103 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of this area and that of the Royalton, Barre, and Northfield quadrangles Oscar Jones occupied 8 triangulation stations and marked 3.

OFFICE WORK.

The drafting of the following topographic maps was completed: Columbia Falls, Great Wass Island, Maine; York, Maine–N. H.; Alton, Gilmanton, Mount Pawtuckaway, N. H.

Preliminary geographic positions were computed for the following quadrangles: Bolton, Montpelier, and Waitsfield, Vt.

EASTERN DEPARTMENT.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Maryland, Pennsylvania, and Virginia. This work included the completion of the survey of 1 special area, 10 quadrangles, and 4 reservoir sites, in addition to which 1 quadrangle was partly surveyed. In addition to this work, the map of an area covering 159 square miles in Virginia was revised. The total new area mapped was 1,512 square miles, 1,412 square miles for publication on the scale of 1:62,500, 97 square miles for publication on the scale of 1:24,000, and 3 square miles for publication on the scale of 1:4,800. In connection with this work 225 miles of primary levels were run and 107 permanent bench marks were established, and 133 miles of primary traverse were run and 20 permanent marks set.

Topographic surveys in eastern department from July 1, 1918, to June 30, 1919.

State.	Contour intervals.	For publication on scale of—			Total area surveyed.	Primary levels.		Primary traverse.	
		1:62,500 (new).	1:24,000 (new).	1:4,800 (new).		Distance run.	Bench marks.	Distance run.	Permanent marks.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Miles.*		*Miles.*	
Maryland	3	.....	.....	3	3	52	70	.....	.....
Pennsylvania	20	93	.....	.....	93	107	34	133	20
Virginia	10	1,319	97	.....	1,416	66	3	.....	.....
	.....	1,412	97	3	1,512	225	107	133	20

Maryland.—The survey of the Gunpowder Neck filling plant, in Harford County, Md., was completed by J. G. Staack, R. M. Herrington, J. L. Lewis, Cornelius Schnurr, and W. H. Schoewe, the total area mapped being 3 square miles, for publication on the scale of 1:4,800, with a contour interval of 3 feet. For the control of this

area H. S. Senseney ran 52 miles of primary levels and established 70 permanent bench marks.

Pennsylvania.—In the spring of 1919 the Topographic and Geological Survey Commission of Pennsylvania allotted $5,000 for cooperative topographic surveys in that State, with the understanding that an equal amount would be expended by the United States Geological Survey when Federal funds became available. The survey of the Meyersdale and Confluence quadrangles, in Fayette and Somerset counties, was begun by Duncan Hannegan, J. M. Whitman, C. E. Bardsley, A. L. Ackers, H. A. Bean, and Bishop Moorhead, the total area mapped being 93 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of these quadrangles F. L. Shalibo and C. E. Bardsley ran 107 miles of primary levels and established 34 permanent bench marks, and C. R. Fisher ran 133 miles of primary traverse and set 20 permanent marks.

Virginia.—For the continuation of cooperative topographic surveys in Virginia the State geologist allotted $4,000 and the United States Geological Survey an equal amount, the amount necessary to complete the surveys being paid from Federal funds. The survey of the Homeville, Ivor, Jarratt, Lawrenceville, and McKenney quadrangles, in Sussex, Southampton, Dinwiddie, Greensville, Brunswick, Surry, Isle of Wight, and Nottoway counties, was completed by Basil Duke, J. J. Phelan, E. E. Harris, J. E. Blackburn, E. M. Levy, U. S. Grant, W. J. Lloyd, S. L. Parker, F. B. Hatch, G. W. Morton, C. D. S. Clarkson, R. H. Chapman, H. S. Paul, Duncan Hannegan, R. W. Burchard, Fred McLaughlin, M. J. Gleissner, Bishop Moorhead, and A. H. Dewey, the total area mapped being 708 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet.

In addition to this work, the survey of Reservoir Sites Nos. 1, 2, 3, and 4, in Clarke, Hampshire, Loudoun, and Rockingham counties, was completed by R. W. Burchard, B. W. Brown, A. L. Ackers, K. K. Kimball, F. L. Whaley, W. R. Chenoweth, and R. L. Harrison, the total area surveyed being 97 square miles, for publication on the scale of 1:24,000, with a contour interval of 10 feet. For the control of these reservoir sites B. W. Brown ran 4 miles of primary levels, no permanent bench marks being established.

In addition to this work, J. I. Gayetty revised the map of the Surry quadrangle, the area covered being 159 square miles, for publication on the scale of 1:62,500.

Virginia-North Carolina.—The survey of the Arringdale, Boykins, Elwood, Emporia, and White Plains quadrangles, in Brunswick, Greensville, Southampton, Sussex, Isle of Wight, and Nansemond counties, Va., and Hertford, Northampton, Gates, Warren, and

Halifax counties, N. C., was completed by A. B. Searle, A. C. Schilling, H. L. Spaulding, W. R. Chenoweth, R. L. Harrison, R. H. Runyan, H. A. Bean, F. L. Whaley, Fred McLaughlin, J. M. Whitman, A. L. Ackers, K. K. Kimball, J. L. Lewis, F. D. Kramer, J. J. Phelan, J. G. Staack, Duncan Hannegan, M. J. Gleissner, R. J. McManamy, A. M. Ockerblad, C. E. Bardsley, R. F. Wilcoxon, and J. E. Blackburn, the total area mapped being 744 square miles, for publication on the scale of 1:62,500, of which area 611 square miles lie in Virginia and 133 square miles lie in North Carolina. For the control of these areas R. B. Steele ran 62 miles of primary levels and established 3 permanent bench marks.

OFFICE WORK.

The drafting of the following topographic maps was completed: Gunpowder Neck, Md.; Camp Abraham Eustis (scale 1:10,000 and 1:20,000), Cape Henry, Jarratt, Ivor, Newport News, Smithfield: King William, Reservoir Sites Nos. 1, 2, 3, and 4, Va.; Boykins, Elwood, Emporia, Suffolk, Va.-N. C.

Progress in the drafting of additional sheets was made as follows, Homeville, Va., 20 per cent; McKenney, Va., 10 per cent; Arringdale, Va.-N. C., 65 per cent; White Plains, Va.-N. C., 75 per cent.

Primary level circuits were adjusted for the following quadrangles: Gunpowder Neck, Md.; Boykins, Va.-N. C.

Geographic positions were computed for the following quadrangles: Camp Abraham Eustis, Cape Henry, and Newport News, Va.; Elwood, Va.-N. C.; Berlin and Meyersdale, Pa.

SOUTHEASTERN DEPARTMENT.

FIELD WORK.

Summary.—During the year topographic mapping was carried on in Georgia, North Carolina, and South Carolina. The work included the completion of the survey of 3 special areas and 24 quadrangles, in addition to which 8 quadrangles were partly surveyed. The total new area mapped was 5,973 square miles, 411 square miles for publication on the scale of 1:10,000, and 5,562 square miles for publication on the scale of 1:62,500. In connection with this work 2,135 miles of primary levels and 231 miles of precise levels were run, and 751 permanent bench marks were established, and 2,673 miles of primary traverse were run and 340 marks were set.

Triangulation was carried on by one party, 19 stations being occupied and 5 permanently marked.

Topographic surveys in southeastern department from July 1, 1918, to June 30, 1919.

State.	Contour interval.	For publication on scale of—		Total area surveyed.	Levels.			Primary traverse.		Triangulation.	
		1:10,000 (new).	1:62,500 (new).		Primary.	Precise.	Bench marks.	Distance.	Permanent marks.	Stations occupied.	Stations marked.
		Sq. mi.	*Sq. mi.*	*Sq. mi.*	*Mi.*	*Mi.*		*Mi.*			
Georgia	10, 20 feet, 5 meters.	114	3,052	3,166	168	.....	208	235	103	.....	.....
North Carolina	5 meters	194	133	327	515	55	127	453	78	19	5
South Carolina	10 feet, 5 meters	103	2,377	2,480	1,452	176	416	1,985	159	.....	.....
		411	5,562	5,973	2,135	231	751	2,673	340	19	5

Georgia.—The survey of the Millen, Bascom, Sylvania, Hephzibah, Register, Brooklet, Dearing, Gough, Egypt, Glennville, Claxton, Spread, and Pembroke quadrangles, in Jenkins, Screven, Burke, Warren, McDuffie, Bulloch, Richmond, Columbia, Emanuel, Jefferson, Effingham, Tattnall, Liberty, and Bryan counties, Ga., was completed, and that of the Meldrim, Rocky Ford, and Appling quadrangles, in Jenkins, Screven, Bulloch, Columbia, Jefferson, Lincoln, McDuffie, Warren, and Glascock counties, was begun by J. F. McBeth, Robert Muldrow, G. E. Sisson, V. S. Seward, Gilbert Young, J. H. Wilke, W. B. Brewer, C. E. Crook, E. B. Hill, J C. Hilliard, C. B. Childs, E. J. Essick, C. L. Sadler, C. B. Moore, A. T. Fowler, J. J. Phelan, C. W. Goodlove, Edgar Allen, H. R. Kilmer, C. R. de Medicis, R. L. McCammon, J. H. Jennings, W. C. Perkins, Horace Roberts, James Dolan, J. F. McCook, Fred Graff, jr., E. H. Stelle, Olinus Smith, C. W. Rowell, J. L. Lewis, J. A. Duck, Crawford Dickey, R. D. Cummin, J. P. Harrison, O. B. Walsh, W. H. S. Morey, W. C. F. Bastian, G. F. Brockman, A. J. Ogle, W. K. McKinley, J. W. Lewis, W. L. Miller, J. M. Rawls, T. F. Slaughter, and J. A. Duck, the total area mapped being 2,637 square miles, for publication on the scale of 1:62,500, with contour intervals of 10 and 20 feet. For the control of the Appling quadrangle L. F. Biggs ran 8 miles of primary levels but established no permanent bench marks, and for the control of the Dearing quadrangle O. B. Walsh ran 20 miles of primary traverse and set one permanent mark.

In addition to this work the survey of the Camp Hancock artillery range, in Richmond County, was completed by J. H. Jennings, C. B. Childs, E. B. Hill, J. C. Hilliard, E. H. Stelle, James Dolan, J. F. McCook, Horace Roberts, W. C. Perkins, David Adams, Gilbert Young, E. M. Peeples, W. B. Brewer, J. P. Harrison, E. E. Harris, and O. B. Walsh, the total area mapped being 114 square miles, for publication on the scale of 1:10,000, with a contour interval of

5 meters. For the control of this special area Horace Roberts, C. H. Semper, W. E. Baird, and E. E. Harris ran 160 miles of primary levels and established 208 permanent bench marks, and E. L. McNair, H. S. Senseney, and O. B. Walsh ran 215 miles of primary traverse and set 102 permanent marks.

Georgia–South Carolina.—The survey of the Peeples, Robbins, Greens Cut, and Clarks Hill quadrangles, in Columbia, Lincoln, Burke, Richmond, and Screven counties, Ga., and Aiken, Hampton, and Barnwell counties, S. C., was completed, and that of the Augusta and Warrenville quadrangles, in Richmond County, Ga., and Aiken County, S. C., was continued, the total area mapped being 1,109 square miles, 415 square miles in Georgia and 694 square miles in South Carolina, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of the Clarks Hill quadrangle L. F. Biggs ran 27 miles of primary levels and established 4 permanent bench marks.

North Carolina.—The survey of the Camp Bragg artillery range, in Cumberland County, N. C., was completed by C. L. Sadler, G. F. Brockman, W. C. F. Bastian, E. K. Nelson, G. R. Richardson, R. T. Mafit, T. S. Marlor, E. N. Murphy, N. E. Ballmer, N. A. Huth, E. G. Hamilton, C. D. Curry, R. A. Furrow, B. A. Jenkins, W. G. Carson, E. J. Essick, and C. W. Stump, jr., the total area mapped being 194 square miles, for publication on the scale of 1:10,000 with a contour, interval of 5 meters. For the control of this special area R. G. Clinite, G. F. Brockman, R. T. Mafit, R. B. Steele, E. K. Nelson, and H. P. Kilby ran 515 miles of primary levels and established 127 permanent bench marks, and C. H. Semper ran 55 miles of precise levels; while E. L. McNair, P. W. McMillen, and L. F. Biggs ran 383 miles of primary traverse and set 74 permanent marks. Triangulation was carried on by G. T. Hawkins and E. L. McNair, 19 stations being occupied, 5 of which were permanently marked.

In addition to this work, for the control of the Southport and Shallotte quadrangles, Oscar Jones ran 70 miles of primary traverse and set 4 permanent marks.

North Carolina–Virginia.—(See Eastern department, pp. 129–130.)

South Carolina.—The survey of the Lodge, St. George, Ridgeville, Summerville, Talatha, Montmorenci, and Allendale quadrangles, in Bamberg, Colleton, Barnwell, Aiken, Edgefield, Dorchester, and Berkeley counties, S. C., was completed, and that of the Moncks Corner, Williston, and Bamberg quadrangles, in Bamberg, Orangeburg, Barnwell, and Aiken counties, was begun by C. W. Goodlove, H. R Kilmer, J. E. King, Edgar Allen, E. V. Holloway, H. D. Clement, F. W. Farnsworth, C. C. Shepard, W. P. Bittenger, C. E. Cooke, E. J. Francis, T. T. Ranney, G. C. Cooke, W. H. Griffin, E. L. Hain, W. B. Upton, jr., Robert Muldrow, C. B. Moore, R. L. Harrison,

H. A. Bean, R. H. Runyan, T. F. Slaughter, A. B. Searle, W. R. Chenoweth, F. L. Whaley, C. R. de Medicis, J. I. Gayetty, W. S. Beames, A. L. Ackers, F. D. Kramer, Basil Duke, R. H. Reineck, and W. K. McKinley, the total area mapped being 1,683 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of these areas and of the Branchville, Orangeburg, Edgefield, Batesburg, Chicora, Eutawville, Mayesville, Bonneau, Edmund, Hopkins, Fort Motte, and Sumter quadrangles H. L. Hudson, S. L. Parker, L. F. Biggs, C. H. Semper, R. G. Clinite, P. W. McMillen, H. P. Kilby, F. L. Shalibo, and H. S. Senseney ran 1,201 miles of primary levels and established 384 permanent bench marks. For the control of the Lexington, Edmund, Hopkins, Fort Motte, Sumter, Mayesville, Manning, Kingstree, Bonneau, Moncks Corner, Ladson, Melgrove, Charleston, and Summerville quadrangles C. H. Semper also ran 177 miles of precise levels. For the control of the Elloree, Rimini, Orangeburg, Edgefield, Batesburg, Chicora, Eutawville, Branchville, Prosperity, Bamberg, Saluda, Bowman, Chapin, Woodford, Rhems, Trio, Scranton, Columbia, Conway, Yauhannah, Oakton, Hyman, Indiantown, Parksville, Seivern, Lexington, Edmund, Hopkins, Fort Motte, Sumter, Mayesville, Manning, Kingstree, Bonneau, Nixonville, Myrtle Beach, and Wampee quadrangles, Oscar Jones, R. B. Steele, and E. L. McNair ran 1,735 miles of primary traverse and established 125 permanent marks.

In addition to this work the survey of the Camp Jackson artillery range, in Richland and Kershaw counties, was completed by C. E. Cooke, E. J. Essick, C. W. Stump, jr., C. B. Childs, J. W. Lewis, R. D. Cummin, J. H. Wilke, C. G. Cooke, W. C. Perkins, E. B. Hill, C. E. Crook, J. C. Hilliard, J. F. McCook, James Dolan, T. T. Ranney, and E. J. Francis, the total area mapped being 103 square miles, for publication on the scale of 1:10,000, with a contour interval of 5 meters. For the control of this special area L. F. Biggs and F. L. Shalibo ran 224 miles of primary levels and established 28 permanent bench marks, and G. T. Hawkins and L. F. Biggs ran 250 miles of primary traverse and set 34 permanent marks.

OFFICE WORK.

The drafting of the following topographic maps was completed: St. Marys, Fla.–Ga.; Claxton, Camp Hancock, Egypt, Glennville, Gough, and Sylvania, Ga.; Greens Cut and Peeples, Ga.–S. C.; Camp Bragg, N. C.; Allendale, Bulls Island, Camp Jackson, Capers Island, Charleston, Cottageville, Fort Moultrie, Green Pond, Cummings, James Island, Johns Island, Edisto Island, Kiawah Island, Ladson, Legareville, Melgrove, Pineland, Shirley, Sewee Bay, Olar, Ravenels, The Jetties, Wando, and Wadmelaw Island, S. C.

Progress in the drafting of additional sheets was made as follows: Cumberland Island, Ga., 80 per cent; Millen, Ga., 55 per cent; Register, Ga., 5 per cent; Ridgeville, S. C., 5 per cent; Spread, Ga., 10 per cent; and Summerville, S. C., 75 per cent.

Primary-level circuits were adjusted for the following quadrangles: Agricola, Appling, Bascom, Brooklet, Claxton, Dearing, Egypt, Glennville, Hephzibah, Meldrim, Millen, Pembroke, Register, Rocky Ford, Rosier, Spread, Stellaville, Sylvania, and Wadley, Ga.; Augusta, Clarks Hill, Greens Cut, Robbins, and Shirley, Ga.-S. C.; Argyle, Camp Bragg, Fayetteville, and Southern Pines, N. C.; Allendale, Camp Jackson, Cummings, Edgefield, Edmund, Eutawville, Hopkins, Moncks Corner, Montmorenci, Olar, Parksville, Peeples, Pineland, Ridgeville, Robbins, St. George, Summerville, Sumter, Talatha, Varnville, and Warrenville, S. C.

Precise-level circuits were adjusted for the following quadrangles: Egypt, Millen, Rocky Ford, Savannah, and Sylvania, Ga.; Augusta, Greens Cut, and Hardeeville, Ga.–S. C.; Allendale, Batesburg, Bonneau, Charleston, Edgefield, Edmund, Fort Motte, Hopkins, Kingstree, Lexington, Mayesville, Manning, Moncks Corner, Summerville, Sumter, and Warrenville, S. C.

Geographic positions were computed for the following quadrangles: Agricola, Altamaha, Camp Hancock, Chalker, Hephzibah, Jesup, Lumber City, Macon, Meriwether, Milledgeville, Perrys Mills, Sandersville, Sparta, Warrenton, Wilcox, Wrightsville, and Wyley, Ga.; Guide and Wampee, N. C.–S. C.; Camp Bragg, Shallotte, Southport, and Wilmington, N. C.; Bamberg, Batesburg, Bonneau, Branchville, Camp Jackson, Conway, Edgefield, Edmund, Florence, Hyman, Indiantown, Kingstree, Lexington, Lodge, Loris, Manning, Marion, Mayesville, Myrtle Beach, Nichols, Nixonville, Oakton, Poston, Prosperity, Rhems, Ridgeville, St. George, Saluda, Scranton, Scivern, Sumter, Timmonsville, Trio, Williston, Woodford, and Yauhannah, S. C.

CENTRAL DEPARTMENT.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Illinois, Iowa, Kentucky, Michigan, West Virginia, and Wisconsin. The work included the completion of one special area, in addition to which six quadrangles were partly surveyed. The total new area mapped was 530 square miles, 459 square miles for publication on the scale of 1:62,500 and 71 square miles for publication on the scale of 1:10,000. In connection with this work 914 miles of primary levels were run and 377 permanent bench marks were established, and 1,411 miles of primary traverse were run and 251 marks set.

Triangulation was carried on in West Virginia by one party, 15 stations being occupied and 13 permanently marked

Topographic surveys in central department from July 1, 1918, to June 30, 1919.

State.	Contour interval.	For publication on scale of—		Total area surveyed.	Primary levels.		Primary traverse.		Triangulation.	
		1:10,000	1:62,500		Distance run.	Bench marks.	Distance run.	Permanent marks.	Stations occupied.	Stations marked.
		Sq. mi.	*Sq. mi.*	*Sq. mi.*	*Miles.*		*Miles.*			
Illinois	20 feet		112	112	112	33	124	9		
Iowa					82	21	158	28		
Kentucky	5 meters.	71		71	222	213	177	135		
Michigan	10 feet		273	273	218	52	436	35		
West Virginia									15	13
Wisconsin			74	74	280	58	516	44		
		71	459	530	914	377	1,411	251	15	13

Illinois.—In the spring of 1919 the Department of Registration and Education allotted $7,000 for cooperative topographic mapping in Illinois, with the understanding that an equal amount would be expended by the United States Geological Survey when Federal funds became available. The survey of the Dongola and Vermont quadrangles, in Fulton, McDonough, Schuyler, Union, Johnson, and Pulaski counties, was begun by C. C. Holder, W. K. McKinley, and J. A. Duck, the total area surveyed being 112 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of these areas S. L. Parker and Crawford Dickey ran 112 miles of primary levels and established 33 permanent bench marks, and F. J. McMaugh ran 124 miles of primary traverse and set 9 bench marks.

Iowa.—In the spring of 1919 the State Geological Survey allotted $3,000 for cooperative topographic mapping in Iowa, with the understanding that an equal amount would be expended by the United States Geological Survey when Federal funds became available. For the control of the Dakota, Lehigh, Corwith, Eagle Grove, Gilmore City, Gowrie, Jefferson, Ogden, Livermore, Ottosen, and Webster City quadrangles J. M. Rawls ran 82 miles of primary levels and established 21 permanent bench marks, and F. J. McMaugh ran 158 miles of primary traverse and set 28 bench marks.

Kentucky.—For the continuation of cooperative topographic surveys in Kentucky the Commissioner of Geology and Forestry allotted $10,000 and the United States Geological Survey allotted an equal amount, the amount necessary to complete the surveys being paid from Federal funds. The survey of the West Point artillery range, in Brewster, Bullitt, Hardin, Jefferson, and Meade counties, was completed by J. G. Staack, J. M. Whitman, C. D. S. Clarkson, R. M. Herrington, C. E. Bardsley, W. R. Chenoweth, R. W. Burchard, R. F. Wilcoxon, E. C. Bebb, Cornelius Schnurr, F. D. Kramer, K. K. Kimball, A. L. Ackers, R. H. Runyan, H. A. Bean, F. L. Whaley, R. L. Harrison, J. L. Lewis, W. W. Keeler, W. H. Schoewe, and

Louis Stroh, the total area surveyed being 71 square miles, for publication on the scale of 1:10,000, with a contour interval of 5 meters. For the control of this area H. S. Senseney and E. C. Bebb ran 177 miles of primary traverse and set 135 permanent marks, and C. F. Urquhart, R. B. Steele, and E. E. Harris ran 222 miles of primary levels and established 213 permanent bench marks.

Michigan.—In the spring of 1919 the State geologist allotted $14,866.67 for cooperative topographic surveys in Michigan, with the understanding that an equal amount would be expended by the United States Geological Survey when Federal funds became available. The survey of the Rives Junction and Springport quadrangles, in Ingham, Jackson, Calhoun, and Eaton counties, was begun by J. H. Jennings, C. L. Sadler, A. J. Ogle, E. J. Essick, N. E. Ballmer, C. W. Stump, jr., R. T. Mafit, and G. R. Richardson, the total area mapped being 273 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of the Stockbridge, Schoolcraft, Sturgis, Burt, Durand, Lapeer, Imlay City, Seymore Lake, Holly, Almont, and Flint quadrangles, G. T. Hawkins ran 436 miles of primary traverse and set 35 bench marks. For the control of the Stockbridge, Schoolcraft, Burt, and Flint quadrangles E. E. Harris ran 218 miles of primary levels and established 52 permanent bench marks.

West Virginia.—In the spring of 1919 the State geologist allotted $1,109.43 for cooperative topographic surveys in West Virginia, with the understanding that the United States Geological Survey would expend an equal amount when Federal funds became available. For the control of the Moorefield, Petersburg, Maysville, Onego, Orkney Springs, White Sulphur Springs, and Elk Garden quadrangles E. L. McNair occupied 15 triangulation stations and marked 13.

Wisconsin.—In the spring of 1919 the State geologist allotted $20,000 for cooperative topographic surveys in Wisconsin with the understanding that an equal amount would be expended by the United States Geological Survey when Federal funds became available. The survey of the Kendall and Mauston quadrangles, in Monroe and Juneau counties, was begun by C. E. Cooke, J. G. Staack, O. H. Nelson, E. B. Hill, C. W. Rowell, H. E. Simmons, J. C. Hilliard, and C. B. Childs, the total area mapped being 74 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of these quadrangles and of the Monroe, Browntown, Blanchardville, New Glarus, Ashland, Odanah, Upson, Mellen, Marys, and Hurley quadrangles S. R. Archer and R. G. Clinite ran 280 miles of primary levels and established 58 permanent bench marks, and H. S. Senseney, D. S. Birkett, R. B. Steele, and Oscar Jones ran 516 miles of primary traverse and set 44 bench marks.

OFFICE WORK.

The drafting of the following topographic maps was completed: Camp Knox, Ky.; Fort Omaha, Nebr., scale 1: 20,000.

Primary-level circuits were adjusted for the following quadrangles: Jonesboro and Vermont, Ill.; Camp Knox, Ky.; Stockbridge, Mich.

Geographic positions were computed for the following quadrangles: Dakota and Lehigh, Iowa; Camp Knox, Ky.; Coldwater, Schoolcraft, Stockbridge, Sturgis, and Union City, Mich.

SOUTHERN DEPARTMENT.

No field work was done in the southern department during the fiscal year.

OFFICE WORK.

The drafting of the following topographic maps was completed: Animas Peak, Antelope Wells, Canutillo, Cienega Springs, Playas, and Pratt, New Mexico; Beaver Creek, Fowlkes, and Maravillas Canyon, Tex.

Progress in the drafting of additional sheets was made as follows: Oatman special, Ariz., 85 per cent.

Geographic positions were computed for the following quadrangles: Camel Mountain, Canutillo, Mount Riley, and Noria, N. Mex.

WESTERN DEPARTMENT.

FIELD WORK.

Summary.—During the year topographic mapping was carried on in California, Idaho, Oregon, and Washington. The work included the completion of 10 quadrangles, in addition to which 11 were partly surveyed. The total new area mapped was 1,765 square miles, 1,575 square miles for publication on the scale of 1: 62,500, 60 square miles for publication on the scale of 1: 31,680, and 130 square miles for publication on the scale of 1: 125,000. In connection with this work 696 miles of primary levels were run and 184 permanent bench marks were established.

Primary triangulation was carried on by two parties in California and Idaho, 19 stations being occupied and 29 permanently marked.

Topographic surveys in western department from July 1, 1918, to June 30, 1919.

State.	Contour interval.	For publication on scale of—			Total area surveyed.	Primary levels.		Triangulation stations.	
		1: 62,500 (new).	1: 31,680 (new).	1:125,000 (new).		Distance run.	Bench marks.	Occupied.	Marked.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Miles.*			
California	5,25,50,100	670	60	110	840	646	173	14	23
Idaho	.....	.....	.....	.....	.....	24	6	5	6
Oregon	25,50	515	.....	.....	515	26	5	.....	.....
Washington	25,50	390	.....	20	410	.....	.....	.....	.....
	.....	1,575	60	130	1,765	696	184	19	29

California.—For the continuation of cooperative topographic surveys in California the Department of Engineering allotted $14,000 and the United States Geological Survey an equal amount, the amount necessary to complete the surveys being paid from Federal funds. The survey of the Hollister and Orestimba quadrangles, in Merced, Stanislaus, San Benito, Monterey, and Santa Clara counties, was completed, and that of the Mount Boardman, Pozo, and Nipomo quadrangles, in San Luis Obispo, Santa Clara, and Stanislaus counties, was begun by E. P. Davis, R. A. Hamilton, William Stranahan, F. C. Witt, Adolph Fankhauser, R. H. Sargent, N. B. Green, C. P. McKinley, C. A. Stonesifer, and R. A. Kiger, the total area mapped being 552 square miles, for publication on the scale of 1:62,500, with contour intervals of 25 and 50 feet. For the control of these areas and of the Avenal and Cholame quadrangles L. F. Biggs and Gerald Fitzgerald ran 167 miles of primary levels and established 48 permanent bench marks. Triangulation was carried on by L. F. Biggs, 14 stations being occupied and 23 permanently marked.

In cooperation with the State of California but not with the War Department, the survey of the Tracy 7½-minute quadrangle, in San Joaquin and Stanislaus counties, was completed, and that of the Trimmer 30-minute quadrangle, in Fresno County, was continued by R. H. Sargent, Charles Hartmann, R. F. Wilcoxon, and B. A. Jenkins, the total area mapped being 228 square miles, 110 square miles for publication on the scale of 1:125,000, and 118 square miles for publication on the scale of 1:62,500, with contour intervals of 50 and 100 feet. For the control of the Tracy quadrangle L. F. Biggs ran 33 miles of primary levels and established 6 permanent bench marks.

Work in San Joaquin Valley was again resumed in cooperation with the State, the survey of the No. 16 quadrangle, in Madera County, being commenced by C. A. Stonesifer and Gerald Fitzgerald, 60 square miles being mapped for publication on the scale of 1:31,680, with a contour interval of 5 feet.

For the control of the Mendota, Madera, No. 16, No. 19, No. 20, Herndon, Bridge, No. 21, Clovis, No. 25, No. 26, San Joaquin, Kearney Park, Carrisalito Spring, Raisin, Helm, Center School, Dos Palos, Oxalis, No. 18, Sheep Ranch, No. 23, Chaney Ranch, No. 24, Tranquillity, Jamison, Kerman, No. 14, No. 17, Wheatville, Firebaugh, Burrel, Conejo, Laton, Riverdale, Fresno, and Caruthers quadrangles L. F. Biggs ran 446 miles of primary levels and established 119 permanent bench marks.

Idaho.—In the spring of 1919 the State Bureau of Mines and Geology allotted $5,000 for cooperative topographic mapping in Idaho, with the understanding that an equal amount would be expended by the United States Geological Survey when Federal funds became available. For the control of the Seven Devils mining district

R. W. Burchard ran 24 miles of primary levels and established 6 permanent bench marks, and R. W. Berry occupied 5 triangulation stations and marked 6.

Oregon.—The survey of the Siltcoos Lake and Heceta No. 4 quadrangles, in Lane and Douglas counties, Oreg., was completed, and that of the Cottage Grove, Yoncalla, Alsea No. 3, Wendling No. 3, and Scottsburg No. 2, in Lane, Douglas, and Linn counties, was begun by E. G. Hamilton, N. A. Huth, C. P. McKinley, R. M. Wilson, R. H. Sargent, W. G. Carson, William Stranahan, F. C. Witt, W. C. Renshaw, W. L. Francis, and E. P. Davis, the total area mapped being 515 square miles, for publication on the scale of 1 : 62,500, with contour intervals of 25 and 50 feet. Of the area mapped in the Siltcoos Lake, Heceta No. 4, Scottsburg No. 2, and Alsea No. 3 quadrangles, 206 square miles lies in the Siuslaw National Forest. For the control of the Scottsburg No. 2 quadrangle, H. B. Ward ran 26 miles of primary levels and established 5 permanent bench marks.

Washington.—For the continuation of cooperative topographic surveys in Washington the State Board of Geological Survey allotted $10,500 and the United States Geological Survey allotted an equal amount, the amount necessary to complete the surveys being paid from Federal funds. The mapping of the Wickersham, Pysht, Crescent Lake, Port Crescent, and Van Zandt quadrangles, in Skagit, Whatcom, and Clallam counties, was completed, and that of the Walla Walla quadrangle, in Columbia County, was begun by C. P. McKinley, R. T. Evans, J. P. Harrison, N. E. Ballmer, R. H. Sargent, R. A. Hamilton, H. B. Ward, E. N. Murphy, T. S. Marlor, K. C. McMurray, C. D. Curry, R. A. Furrow, W. G. Carson, and F. A. Danforth, the total area mapped being 410 square miles, 390 square miles for publication on the scale of 1:62,500, and 20 square miles for publication on the scale of 1:125,000, with contour intervals of 25 and 50 feet. Of the Pysht, Crescent Lake, and Port Crescent quadrangles, 226 square miles lies in the Olympic Forest Reserve.

OFFICE WORK.

The drafting of the following topographic maps was completed: Adelaida, Bradley, Bryson, Crevison Peak, King City, Junipero Serra, Las Garzas Creek, Lucia, Orestimba, Paso Robles, Point Sur, San Benito, San Luis Creek, San Simeon, Calif.; Heceta (southeast quarter) and Siltcoos Lake, Oreg.; Port Crescent and Van Zandt, Wash.

Progress in the drafting of additional sheets was made as follows: Daulton, Calif., 98 per cent; Elgin, Calif., 85 per cent; Gilroy Hot Springs, Calif., 85 per cent; Gonzales, Calif., 15 per cent; Hollister, Calif., 15 per cent; Jamesburg, Calif., 85 per cent; Los Banos, Calif., 50 per cent; Metz, Calif., 90 per cent; No. 10, Calif., 85 per cent;

Crescent Lake, Wash., 10 per cent; Pysht, Wash., 95 per cent; and Wickersham, Wash., 35 per cent.

Primary-level circuits were adjusted for the following quadrangles: Adelaida, Cayucos, Gorda, Lucia, Madera, Mount Boardman, Mojave (Tehachapi Pass), Piedras Blancas, San Luis Obispo, San Simeon, and Tracy, Calif.; Van Zandt and Wickersham, Wash.

Geographic positions were computed for the following quadrangles: Academy, Adelaida, Berenda, Bonanza, Bradley, Bryson, Bridge, Clovis, Daulton, Dos Palos, Fresno, Friant, Gonzales, Gustine, Helm, Herndon, Hollister, Ingomar, Jamison, Junipero Serra, Jamesburg, Kearney Park, Kerman, King City, Kings River, Los Banos, Madera, Malaga, Metz, No. 8, No. 10, No. 16, No. 17, No. 19, No. 20, No. 21, No. 22, No. 23, No. 24, Paso Robles, Point Sur, Reedley, Salinas Valley, San Benito, Sandy Mush, San Joaquin, Sanger, San Luis Ranch, San Miguel, San Simeon, Selma, Sharon, Sheep Ranch, Squaw Valley, Sultana, Tranquillity, Volta, and Wahtoke, Calif.; Coppereid, Lovelocks, and Rochester, Nev.; Alsea No. 3, Oreg.; Pysht, Wash.

WATER-RESOURCES BRANCH.

ORGANIZATION.

The work of the water-resources branch is conducted under the supervision of N. C. Grover, chief hydraulic engineer, and is organized in five divisions:

Division of surface water, John C. Hoyt, hydraulic engineer, in charge.
Division of ground waters, O. E. Meinzer, geologist, in charge.
Division of quality of water, Alfred A. Chambers, assistant chemist, in charge.
Division of power resources, W. B. Heroy, geologist, in charge.
Division of enlarged and stock-raising homesteads, H. C. Cloudman, classifier, in charge.

PERSONNEL.

During the year the technical force was reduced by 86, of whom 34 entered the military service and 52 resigned, died, or were transferred, and was increased by 43, through reinstatements of men from military service and new appointments—a net reduction of 43. At the end of the year the force consisted of 1 chief hydraulic engineer, 18 hydraulic engineers, 18 engineers, 27 assistant engineers, 11 junior engineers, 1 geologist, 3 associate geologists, 3 assistant geologists, 1 assistant chemist, 3 junior chemists, 3 classifiers, 9 assistant classifiers, and 20 junior classifiers, a total of 118. Of this number 1 hydraulic engineer, 2 assistant engineers, 1 classifier, 6 assistant classifiers, and 14 junior classifiers are on furlough, and 1 hydraulic engineer, 13 engineers, 1 assistant engineer, and 1 classifier are employed occasionally.

In the clerical force there were 14 separations and 9 accessions, and at the end of the year the force numbered 32.

The following members of the water-resources branch entered the military service. The status given is that of June 30, 1919.

Richard Aitken, Naval Reserve.
Herbert A. R. Austin, first lieutenant; honorably discharged December 17, 1918.
Charles R. Bell, Artillery Observation Service training camp; honorably discharged November 24, 1918.
Leland Bell, ensign, U. S. Naval Reserve; inactive duty April 10, 1919.
Revoe C. Briggs; honorably discharged December 24, 1918.
John S. Brown, second lieutenant; honorably discharged January 11, 1919.
Kirk Bryan,[1] second lieutenant; honorably discharged February 27, 1919.
Earl H. Buchanan, Company A, One Hundred and Twenty-eighth Engineers.
John W. Campbell,[1] second lieutenant.
Harold C. Cloudman,[1] captain; honorably discharged April 19, 1918.
Frederick C. Corey, U. S. Naval Reserve officers' training school, inactive duty February 19, 1919.
George S. Cowdery, jr.[1]
Aldace H. Davison,[2] captain; honorably discharged June 18, 1919.
Henry J. Dean,[2] first lieutenant; honorably discharged June 30, 1919.
Jesse E. Dickerson, honorably discharged December 18, 1918.
William E. Dickinson,[2] second lieutenant; honorably discharged April 16, 1918.
Joseph J. Dirzulaitis; honorably discharged January 16, 1919.
Charles J. Downing, ensign, U. S. Naval Reserve; inactive duty April 17, 1919.
Max Drill, Coast Artillery school for officers; honorably discharged November 21, 1918.
Donald A. Dudley,[1] sergeant; honorably discharged June 4, 1919.
Joe B. Entringer,[1] second lieutenant; honorably discharged December 3, 1918.
Albert G. Fiedler,[1] second lieutenant; inactive duty November 28, 1918.
Edgar O. Francisco, first lieutenant; honorably discharged April, 1919.
Raymond E. Gaylord, second lieutenant; honorably discharged December 18, 1918.
Wilbur R. Gore, honorably discharged December 14, 1918.
Marcus L. Gossard.
Eugene L. Grant,[1] ensign, U. S. Naval Reserve; inactive duty March 6, 1919.
Homer E. Grosbach,[1] Aviation Service.
Warren E. Hall,[1] captain.
Oliver W. Hartwell,[2] first lieutenant; honorably discharged October 20, 1917.
Bryant L. Hopkins, honorably discharged November 28, 1918.
Bernard A. Howell,[1] second lieutenant.
Clarence C. Jacob,[2] captain; honorably discharged December 11, 1917.
Reid Jerman,[1] second lieutenant; honorably discharged December 1, 1918.
Fred E. Keating, base-hospital laboratory, Camp Upton, N. Y.
Joseph Krauskopf,[1] corporal; honorably discharged April 9, 1919.
W. A. Lamb, captain; inactive duty February 7, 1919.
George K. Larrison,[2] captain; honorably discharged December 31, 1918.
Otto Lauterhahn,[1] sergeant, Q. M. C. Graves Registration Service.
Ariel Lindquist, honorably discharged November 29, 1918.
George J. Lyon,[1] captain.
Floyd B. McGregor, honorably discharged February 20, 1919.
Lester R. McNeely,[1] honorably discharged May 8, 1919.
Paul G. Mayer,[1] corporal; honorably discharged April 3, 1919.
Oscar E. Meinzer, captain; honorably discharged December 13, 1918.
Arthur H. Montford,[1] honorably discharged December 11, 1918.
Robert E. Morgan, sergeant; honorably discharged February 17, 1919.
J. Wendell Moulton,[1] honorably discharged December 3, 1918.

[1] Reported fiscal year 1918. [2] Reported fiscal year 1917.

Malcolm G. Murray,[1] honorably discharged June 12, 1919.
John R. Neale.[1]
Carl G. Paulsen, sergeant; honorably discharged December 21, 1917.
Charles H. Pierce,[2] first lieutenant; inactive duty April 12, 1918.
Roy H. Quinn, sergeant; honorably discharged January 8, 1919.
James P. Reddick,[1] inactive duty April 17, 1919.
Clyde P. Ross, private; honorably discharged December 12, 1918.
John J. Sanford,[1] first lieutenant; inactive duty August 7, 1917.
Merritt L. Shearer, honorably discharged December 11, 1918.
Albert H. Shunk, musician; honorably discharged February 6, 1919.
George H. Smalley,[1] ensign, U. S. Naval Reserve; inactive duty March 26, 1919.
M. Reginald Stackpole, honorably discharged November 27, 1918.
James E. Stewart,[1] honorably discharged November 20, 1917.
Herman A. Stone, honorably discharged December 9, 1918.
Harry Thompson,[1] captain; inactive duty February 11, 1918.
Marion I. Walters, corporal; honorably discharged February 5, 1919.
Arnold N. Weeks, ensign, U. S. Naval Reserve.
Eugene L. Williams,[1] first lieutenant; honorably discharged December 23, 1918.
Allen L. Willie, honorably discharged December 3, 1918.
Leon Willie,[1] U. S. Navy, honorably discharged December 24, 1918.

ALLOTMENTS.

The appropriation for gaging streams was $148,244.10. The cooperative funds made available by State allotments, totaling $126,195, have been increased in some States and decreased in others, making necessary corresponding adjustments of this work.

The appropriation for examination of lands under the stock-raising homestead law enacted December 29, 1916, was $197,268.60.

The appropriations were allotted as follows:

For gaging streams:			
General administration:			
Direct	$9,898.98		
Denver office	2,200.00		
		$12,098.98	
Scientific and technical equipment		863.55	
Editorial work		1,747.50	
Branch administration		6,500.00	
Computations		10,500.00	
Reviewing manuscripts		1,800.00	
Inspection		1,000.00	
			$34,510.03
Surface water:			
New England:			
Maine and Connecticut	$1,350.00		
New Hampshire	1,000.00		
Vermont	900.00		
Massachusetts	2,250.00		
		5,500.00	
New York		4,000.00	
Middle Atlantic States		600.00	
South Atlantic States		5,000.00	
Texas		4,000.00	

[1] Reported fiscal year 1918.

[2] Reported fiscal year 1917.

For gaging streams—Continued.			
Surface water—Continued.			
Upper Mississippi River:			
Wisconsin	$2,500.00		
Minnesota and Iowa	2,500.00		
Illinois	1,000.00		
		$6,000.00	
Colorado, Wyoming, and New Mexico		7,000.00	
Montana	$4,000.00		
North Dakota	300.00		
		4,300.00	
Great Basin:			
Utah	4,000.00		
Nevada	2,500.00		
		6,500.00	
Idaho		2,800.00	
Oregon		4,000.00	
Washington		4,000.00	
California		4,000.00	
Hawaii at Honolulu	$4,000.00		
Hawaii at Washington	500.00		
		4,500.00	
Kansas		2,500.00	
Arizona		2,500.00	
			$67,200.00
Ground water:			
General		14,000.00	
Coastal Plain		1,400.00	
			15,400.00
Quality of water			9,500.00
Power resources			12,000.00
Land-classification board			7,000.00
Utilization			2,300.00
Contingent			334.07
			148,244.10
For enlarged and stock-raising homesteads:			
Field work		$120,209.41	
Land-classification board		55,000.00	
General administration		14,179.19	
Branch administration		7,880.00	
			197,268.60

Of the total appropriations, 85 per cent was allotted for work in public-land States.

COOPERATION.

States.—The following amounts were expended by several States from cooperative allotments:

Alabama		$205.00
Arizona		3,015.00
California:		
State engineer	$7,190.00	
State Water Commission	8,530.00	
City of San Francisco	2,145.00	

California—Continued.		
San Bernardino, Riverside, and Orange counties	$3,000.00	
		$20,865.00
Colorado		700.00
Georgia		505.00
Hawaii		19,000.00
Idaho		1,310.00
Illinois		2,550.00
Iowa:		
State Geological Survey	$545.00	
State Highway Commission	1,150.00	
		1,695.00
Kansas		3,250.00
Kentucky		250.00
Maine		5,000.00
Massachusetts		3,240.00
Montana		2,205.00
Nevada		2,085.00
New Hampshire		2,395.00
New York:		
State engineer	$2,380.00	
Conservation Commission	8,630.00	
		11,010.00
North Carolina		280.00
North Dakota		600.00
Oregon		5,735.00
South Dakota		180.00
Tennessee		660.00
Texas		9,830.00
Utah		7,290.00
Vermont		1,330.00
Washington		11,035.00
Wisconsin		5,160.00
Wyoming		4,815.00
		126,195.00

The work done under cooperative agreement with the States has been restricted to studies of stream flow, except in California.

War Department.—Many reports based on special field investigations and office studies were prepared and submitted to the War Department and bureaus engaged in the conduct of the war.

Reclamation Service.—The measurement of streams that are to furnish water to reclamation projects under construction has been continued in cooperation with the United States Reclamation Service. The field work is done by Survey engineers who are employed in the locality, and the actual cost is repaid by the Reclamation Service through transfer of funds.

The Survey also continued to assist the Reclamation Service in an investigation undertaken to obtain a basis for the equitable distribution of the waters of Milk and St. Mary rivers—a work carried on

under cooperative agreement with the Canadian Department of the Interior.

Office of Indian Affairs.—In accordance with authorization by the Office of Indian Affairs, stream gaging was continued on the Menominee, Crow, Fort Hall, Yakima, Colville, Quinault, Klamath, Warm Springs, Gila River, western Shoshone, and Uinta Indian reservations.

National Park Service.—Streams in the Yosemite and Yellowstone national parks were measured during the year at stations maintained in cooperation with the National Park Service.

Forest Service.—A study of stream flow in the Angeles National Forest, in southern California, was continued in cooperation with the Forest Service.

City of San Francisco.—In connection with the proposed storage of the water of Tuolumne River in Hetch Hetchy Valley as a water supply for the city of San Francisco, measurement of that stream was continued in cooperation with the city government.

PUBLICATIONS.

The publications of the year prepared by the water-resources branch comprise 14 reports and 2 separate chapters. Titles and brief summaries of these publications are given on pages 503–505. At the end of the year 21 reports were in press and 1 3amnuscripts were awaiting editorial examination.

GENERAL SUMMARY.

Investigations of surface streams have been continued by maintaining gaging stations for measuring their discharge in 38 States and in Hawaii and Alaska. Cooperation with States and other Federal organizations has made possible the large amount of work in progress. Twenty-three cooperating States (including Hawaii) have contributed $126,195 for work in these States, and the Indian Office, Engineer Corps, National Park Service, and Reclamation Service have also contributed largely to the study of the flow of particular streams.

General ground-water investigations have been in progress in 12 States. In addition many special investigations of the quantity and quality of ground-water supplies for various army and naval establishments have been made.

Many investigations of the present and probable future use of both surface and ground waters have been made in connection with the classification of public lands, with special reference to their use for power, under permit, or for agriculture, under the enlarged-homestead, desert-land, or Carey acts. The results of such investigations are generally incorporated in unpublished special reports to the Commissioner of the General Land Office and to the Secretary of the Interior.

Investigations, made in cooperation with the United States Fuel Administration, of problems relating to the operation of power plants, interconnection of transmission systems, and substitution of water power for fuel power, have led to improvement in service and to conservation of fuel. The statistical studies of power resources and output have been continued since the signing of the armistice.

DIVISION OF SURFACE WATERS.

ORGANIZATION.

The work of the division of surface waters consists primarily of the measurement of the flow of rivers, but it includes also special investigations of conditions affecting stream flow and the utilization of the streams.

In carrying on the work the United States is divided into 16 districts, including Hawaii. The location of the districts and district offices and the names of the engineers in charge are given in the following list:

New England: C. H. Pierce, Customhouse, Boston, Mass.
New York: C. C. Covert, Journal Building, Albany, N. Y.
Pennsylvania: R. A. Boehringer, Telegraph Building, Harrisburg, Pa.
Middle Atlantic and Ohio River: G. C. Stevens, Washington, D. C.
South Atlantic and eastern Gulf: W. E. Hall, Post Office Building, Atlanta, Ga.
Upper Mississippi River: W. G. Hoyt, Capitol Building, Madison, Wis.; suboffices, Kimball Building, Chicago, Ill., and Ames, Iowa.
Kansas: R. C. Rice, Federal Building, Topeka, Kans.
Upper Missouri River: W. A. Lamb, Montana National Bank Building, Helena, Mont.
Rocky Mountain: Robert Follansbee, New Post Office Building, Denver, Colo.
Great Basin: A. B. Purton, Federal Building, Salt Lake City, Utah.
Idaho: C. G. Paulsen, Idaho Building, Boise, Idaho.
Washington: G. L. Parker, Federal Building, Tacoma, Wash.
Oregon: F. F. Henshaw, Post Office Building, Portland, Oreg.
California-Arizona: H. D. McGlashan, Customhouse, San Francisco, Calif.; suboffices, Federal Building, Los Angeles, Calif., and Tucson, Ariz.
Texas: C. E. Ellsworth, Capitol Building, Austin, Tex.
Hawaii: James E. Stewart, Capitol Building, Honolulu, Hawaii.

CHARACTER AND METHODS OF WORK.

Field investigations necessary to the work are made from the district offices, where the results are sufficiently analyzed to insure accuracy and completeness. At selected places, known as gaging stations, the volume of water carried by the streams is measured and records of stage and other data are collected from which the daily flow of the streams is computed. Data collected from the district offices are transmitted to Washington, where they are reviewed in the computing section and prepared for publication. By this review the records obtained in different parts of the country are brought to a uniform standard, and standardization is further effected through annual conference of the engineers.

At the end of the year 1,251 gaging stations were being maintained, including 81 in Hawaii; 173 stations were discontinued and 242 new stations established during the year. Records for about 190 addi-

tional stations were received, ready for publication, from other Government bureaus and private persons, and a number of Government and State organizations and individuals also cooperated in the maintenance of many of the regular gaging stations.

Gaging stations and cooperating parties for the year ended June 30, 1919.

State.	Geological Survey alone.	Reclamation Service.	Forest Service.	Indian Office.	Army engineers.	Weather Bureau.	Other Federal bureaus.	State cooperation.	Municipal cooperation.	Private persons.	Counted more than once.	Maintained at end of year.	Established during year.	Discontinued during year.	Regular gagings during year.	Miscellaneous gagings during year.
Alabama					1			4		1		6	1		17	2
Arizona		1		4	2			13		1	4	17		7	237	61
California			26	1		2	5	161	29	33	96	161	9	10	952	358
Colorado	7	2	15			1		12	2	5	1	43	1	6	130	4
Connecticut										2		2	1		13	
Florida																1
Georgia						3		7		13	1	22	5	2	81	15
Idaho		1	1	14		1		30	1	124	25	150	113	24	614	46
Illinois					1			24	1	1	3	24	1	3	81	
Indiana										1		1	1	1		
Iowa						3		24		5	8	24	3		113	
Kansas						1		11			1	11	4	2	79	2
Kentucky								4				4				
Maine								16		2	2	16			50	
Maryland	3											3			2	
Massachusetts								16		1	1	16	1		120	2
Michigan									1	1		2				
Minnesota	1				3	2		1				7		1	13	
Montana	8	49	4	7				18		3		89	3	19	408	129
Nevada		2		2		1		27		6	11	27		5	85	3
New Hampshire								10		7	7	10			70	1
New Jersey	1											1				
New York					1	1		56	1	11	17	56	13	2	278	44
North Carolina						1		3		4		8	3		26	3
North Dakota							3	9				12	6		9	5
Ohio					2							2				
Oklahoma	1				2							3		1		
Oregon		4	1	10		2		16	13	45	1	90	12	8	336	43
South Dakota								1				1	1	5	3	
Tennessee						8		11		5	7	17	12	3	42	5
Texas		1				3		42	5	4	13	42	1	1	352	194
Utah		1		5				110	2	75	83	110	3	6	719	73
Vermont								9		4	4	9			56	
Virginia	2					1				2		5				
Washington	2	1	7	11			1	5	9	34	1	69	10	2	434	13
West Virginia	5				6							11		5		
Wisconsin				2	2			46		12	16	46	1		195	8
Wyoming		9	5			1	3	43		7	15	53	21	52	368	36
Hawaii								81	2	31	33	81	16	8	390	29
	30	74	59	56	20	34	12	810	66	440	350	1,251	242	173	6,303	1,077

PUBLICATIONS.

For convenience and uniformity in publication the United States has been divided into 12 primary drainage basins, and the results of stream measurements are published annually in a series of progress reports that correspond to these 12 divisions. Prior to 1914 the records for each division were contained in a single water-supply paper; since 1914 the records for the twelfth division have been published in three papers. In addition to the progress reports, special reports on various hydraulic subjects have been completed for publication during the year, including a report on the water supply of St. Mary and Milk rivers, which was prepared in cooperation with the Reclamation Service, Department of the Interior, Canada, for publication by the International Joint Commission.

The following table shows the division into drainage areas and gives the numbers of water-supply papers containing results of stream measurements for 1899 to 1919:

Numbers of water-supply papers containing results of stream measurements, 1899–1919.

Year.	I North Atlantic slope (St. John River to York River).	II South Atlantic and eastern Gulf (James to the Mississippi).	III Ohio River.	IV St. Lawrence River and Great Lakes.	V Hudson Bay and upper Mississippi River.	VI Missouri River.	VII Lower Mississippi River.	VIII Western Gulf of Mexico.	IX Colorado River.	X Great Basin.	XI Pacific slope in California.	XII North Pacific slope basins.		
												Pacific slope in Washington and upper Columbia River.	Snake River basin.	Lower Columbia River and Pacific slope in Oregon.
1899 [a]	35	[b] 35, 36	36	36	36	[c] 36, 37	37	37	[d] 37, 38	38, [e] 39	38, [f] 39	38	38	38
1900 [g]	47, [h] 48	48	48, [i] 49	49	49	49, [j] 50	50	50	50	51	51	51	51	51
1901	65, 75	65, 75	65, 75	65, 75	[k] 65, 66, 75	66, 75	[k] 65, 66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75
1902	82	[b] 82, 83	83	[l] 82, 83	[k] 83, 85	84	[k] 83, 84	84	85	85	85	85	85	85
1903	97	[b] 97, 98	98	97	[k] 98, 99, [m] 100	99	[k] 98, 99	99	100	100	100	100	100	100
1904	[n] 124, [o] 125, [p] 126	[p] 126, 127	128	129	[k] 128, 130	130, [q] 131	[k] 128, 131	132	133	133, [r] 134	134	135	135	135
1905	[n] 165, [o] 166, [p] 167	[p] 167, 168	169	170	171	172	[k] 179, 173	174	175, [s] 177	176, [r] 177	177	178	178	[t] 177, 18
1906	[n] 201, [o] 202, [p] 203	[p] 203, 204	205	206	207	208	[k] 205, 209	210	211	212, [r] 213	213	214	214	214
1907–8	241	242	243	244	245	246	247	248	249	250, [r] 251	251	252	252	252
1909	261	262	263	264	265	266	267	268	269	270, [r] 271	271	272	272	272
1910	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911	301	302	303	304	305	305	307	308	309	310	311	312	312	312
1912	321	322	323	324	325	326	327	328	329	330	331	332–A	332–B	332–C
1913	351	352	353	354	355	356	357	358	359	360	361	362–A	362–B	362–C
1914	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919	501	502	503	504	505	506	507	508	509	510	511	512	513	514

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Tables of monthly discharge for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and Kern rivers and south Pacific slope basins.
[g] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables of monthly discharge for 1900 in Twenty-second Annual Report, Part IV.
[h] Wissahickon and Schuylkill rivers to James River.
[i] Scioto River.
[j] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[k] Tributaries of Mississippi from east.
[l] Lake Ontario and tributaries to St. Lawrence River proper.
[m] Hudson Bay only.
[n] New England rivers only.
[o] Hudson River to Delaware River, inclusive.
[p] Susquehanna River to Yadkin River, inclusive.
[q] Platte and Kansas rivers.
[r] Great Basin in California except Truckee and Carson river basins.
[s] Below junction with Gila.
[t] Rogue, Umpqua, and Siletz rivers only.

DIVISION OF GROUND WATERS.

WAR WORK.

During the fiscal year 1918–19 the energies of the division of ground waters were devoted chiefly to war work. By the end of the war half the men of the division were with the colors, and the rest, working as civilians, were occupied almost exclusively with problems of military water supplies. Capt. O. E. Meinzer and Second Lieut. Kirk Bryan were assigned to duty as water-supply geologists in the geologic section of the general headquarters of the American Expeditionary Forces, but the armistice was signed before they were able to render productive service in these assignments.

The war work of the division consisted of (1) giving information and advice to the War and Navy departments and to other Government departments engaged in war work in regard to water supplies from wells and springs, (2) mapping and describing water supplies along the international border and the Atlantic coast for the progressive military map of the United States.

During the war information and advice were given to the War and Navy departments in regard to water supplies at about 100 military and naval establishments in the United States, such as cantonments, forts, navy yards, aviation fields, powder factories, arsenals, and supply depots. A large part of the advice was based on data previously procured, but field investigations were made at many points. Most of the work for the War Department was done at the request of and in cooperation with the water-supply section of the Constructing Quartermaster's Division; most of the work for the Navy Department was done for the Bureau of Yards and Docks. In this work the division cooperated closely with the section of Coastal Plain geologic investigations, and many of the investigations and reports were made by the geologists of that section, under the direction of T. W. Vaughan, geologist in charge. (See pp. 528–529.) This war work is not here described in detail.

Maps were prepared to show the water supplies in the region along the international border from Nogales, Ariz., to the Pacific coast. These maps were based on field maps of surveys of desert watering places made during the preceding fiscal year. They were completed and transmitted to the War Department at the request of the Corps of Army Engineers for use on the progressive military map of the United States. Surveys were made for the same purpose in the Atlantic Coastal Plain, chiefly in Virginia and South Carolina, under the direction of T. W. Vaughan. (See pp. 621–622.)

During Mr. Meinzer's absence in the military service A. J. Ellis was the acting chief of the division, and many of the investigations for the War Department were made by him or under his direct supervision.

OTHER WORK.

During the preceding fiscal year about 60,000 square miles in southern California and southwestern Arizona was surveyed with a view to mapping the desert watering places of the region and describing them and the routes to them in a series of guidebooks. The work included also the erection of 305 signposts bearing 635 enameled sign boards, each giving the direction and distance of one to five watering places. The preparation and publication of the guidebooks was seriously delayed by the war, but before the end of the fiscal year the manuscript and maps for two of the books were transmitted to the Director and the work on the rest was well advanced. This work was done under a comprehensive plan for mapping and marking the watering places in the entire arid region east of the Sierra Nevada and Cascade Mountains and west of a line running approximately from eastern Oregon through Salt Lake City and Santa Fe to the mouth of Pecos River.

The exploratory drilling project in Steptoe Valley, Nev., to discover water for irrigation was brought to an end soon after the beginning of the fiscal year with a pumping test of the third well drilled, which showed that the well would yield enough water to irrigate 80 acres of land. A report on this project was completed by W. O. Clark and C. W. Riddell, with an introduction by O. E. Meinzer. Copies of this report were filed for consultation by the public in the Washington and Salt Lake City offices of the United States Geological Survey and with the mayor of Ely, Nev. A copy was also transmitted to the Director for publication as a water-supply paper.

A bibliography of the publications of the United States Geological Survey relating to ground water, with brief abstracts, detailed index, and map, by O. E. Meinzer, was published as Water-Supply Paper 427.

An outline and glossary of terms relating to ground water was prepared by Mr. Meinzer and was submitted to numerous authorities for criticism.

During the last few months of the fiscal year Mr. Meinzer made much progress on a general treatise on ground water in the United States. Some work was also done on a comprehensive study, begun several years ago, of the Pleistocene and present physiography and hydrology of the closed basins of the western United States.

Mr. Ellis continued his work as specialist on mineral waters for the division of mineral resources. The chapter on the production of mineral waters in 1917 was published, and the chapter on the production in 1918 was prepared. A forecast of the mineral-water trade in 1919 was prepared and sent to the Director.

Cooperation with the committee on physiography was continued through Mr. Meinzer, who serves on that committee.

WORK BY STATES.

Below are summaries, by States, of the investigations of ground water that were in progress during the year, except those relating directly to the war. Nearly all these investigations were delayed by the war. Much information of general value was also obtained in connection with the military investigations in Alabama, California, Massachusetts, North Carolina, New York, Rhode Island, Texas, Virginia, and other States.

Arizona.—Half the work on desert watering places was done in Arizona. The region south of Gila River, extending from Tucson and Nogales to Yuma, was covered by Kirk Bryan; Gila Valley and the region extending north from this valley to Wickenburg and Parker was covered by C. P. Ross. Guides to watering places, with descriptions of the geography, geology, and water resources of these regions, are being prepared.

A brief report on the geology and water resources of the San Carlos Indian Reservation, written in a previous year by A. T. Schwennesen, was sent to the Government Printing Office for publication as a part of "Contributions to hydrology" (Water-Supply Paper 450–A).

California.—Half the work on desert watering places was done in California. The desert parts of San Bernardino County and adjoining areas were surveyed by D. G. Thompson, and those of Imperial, Riverside, and San Diego counties were surveyed by J. S. Brown.

Guides and maps for the entire region were completed and were transmitted to the Director for publication. More comprehensive water-supply papers, which contain much information on the geography, geology, and water resources of the region, are in preparation.

A report on ground water in San Jacinto and Temecula basins, by G. A. Waring, sent to the Government Printing Office in the preceding fiscal year to be published as Water-Supply Paper 429, remained unpublished at the end of this fiscal year on account of the congestion of printing caused by the war.

A report on the geology and ground-water resources of the western slope of San Diego County, by A. J. Ellis and C. H. Lee, was sent to the printer to be published as Water-Supply Paper 446.

A report on ground water in Ivanpah, Mesquite, and Pahrump valleys, by G. A. Waring, was transmitted for publication as one of the "Contributions to hydrology" (Water-Supply Paper 450–C).

A report on ground water in Lanfair Valley, by D. G. Thompson, was also transmitted to the Director to be published as one of the "Contributions to hydrology" (Water-Supply Paper 450–B).

A comprehensive report on ground water in Sacramento Valley, by Kirk Bryan, was completed and transmitted to the Director for publication as a water-supply paper.

A large report on ground water in Santa Clara Valley, the product of several years of investigation by W. O. Clark, was nearly completed at the end of the fiscal year. On account of his service in war work Mr. Clark was able to make very little progress on his investigations of the ground water in Salinas Valley. In connection with certain war work, however, he collected valuable data on the wells and water resources of Napa Valley.

Measurements of depth to the water level in a series of wells in southern California have been made at intervals since 1900 for the purpose of obtaining a long record of the relation between the contributions to the subterranean reservoirs in the rainy seasons and the withdrawals from them in the dry seasons, when ground water is pumped for irrigation and is withdrawn in large quantities by evaporation and transpiration. These measurements were continued by F. C. Ebert. Mr. Ebert also compiled the Survey's records of the water levels in southern California and transmitted the resulting report for publication as a water-supply paper.

All the ground-water work in California is done in financial cooperation with the State Department of Engineering.

Connecticut.—Three completed reports based on investigations made in previous years in cooperation with the State Geological and Natural History Survey, H. E. Gregory, State geologist, are awaiting publication. These reports cover the Meriden area, by G. A. Waring (Water-Supply Paper 449); the Southington-Granby area, by H. S. Palmer (Water-Supply Paper 466); and the Norwalk, Suffield, and Glastonbury areas, by H. S. Palmer (Water-Supply Paper 470). The delay in the publication of these reports is due chiefly to the exigencies of the war.

An investigation of the ground-water conditions in Pomperaug Valley, by A. J. Ellis, remains unfinished.

In March Mr. Meinzer, in company with Prof. Gregory, made a brief trip to the northeastern part of the State to devise plans for increasing the water supplies of the State Agricultural College and the State Training School and Hospital near Mansfield.

In April J. S. Brown, in extension of the systematic ground-water survey of the State, began field work on the ground waters along the coast of Connecticut, giving special consideration to the effect of sea water on the quality of these waters. This investigation is under the direction of Prof. Gregory and is paid for chiefly by the State.

Mississippi.—The investigation of ground water in Mississippi, which was begun in a previous year, was continued in cooperation with the section of Coastal Plain investigations.

Montana.—An investigation of ground water in Montana was begun in August, 1915, by A. J. Ellis. In 1915 and 1916 the region south of Yellowstone River was covered by field work, and in the summer of 1917 a ground-water survey was made of Musselshell

County. Reports on both regions are in preparation, but the work has been greatly delayed.

Nevada.—A report on ground water in Reese River valley and an adjacent part of Humboldt River valley, by G. A. Waring, was published as Water-Supply Paper 425–D. The area covered in the report by Mr. Waring on the Ivanpah, Mesquite, and Pahrump valleys lies in part in Nevada. (See California.)

The exploratory drilling in Steptoe Valley was brought to a close with very satisfactory results. A report on the test wells and on the ground-water conditions and irrigation prospects of the valley was prepared by W. O. Clark and C. W. Riddell and was transmitted to the Director for publication as a water-supply paper.

New Mexico.—A report on ground water in the Animas, Playas, Hachita, and San Luis basins, in Grant County, N. Mex., by A. T. Schwennesen, with analyses of water and soil by R. F. Hare, was published as Water-Supply Paper 422. Analyses of samples of water and of the water-soluble contents of samples of soil from these basins were made, through cooperation, by the New Mexico Agricultural Experiment Station.

Oklahoma.—In September, 1918, D. G. Thompson examined a newly discovered artesian basin in the vicinity of Gage, Okla. A manuscript report prepared by Mr. Thompson on the results of his investigation was made public by being submitted to Hon. James V. McClintic.

South Carolina.—The survey of the ground-water resources of the Coastal Plain province of South Carolina was continued in cooperation with the section of Coastal Plain investigations, the work being done by C. W. Cooke, under the direction of T. W. Vaughan. Samples of water collected in connection with this investigation were sent to the water-resources laboratory for analysis.

South Dakota.—A report on artesian water in the vicinity of the Black Hills, S. Dak., by N. H. Darton, was published as Water-Supply Paper 428. This report is a revision of earlier reports on the area by Mr. Darton and includes much new material.

Texas.—The work in Texas was carried on in cooperation with the section of Coastal Plain investigations. The field of study included the central and western parts of the Coastal Plain province.

Special ground-water investigations were made by Mr. Thompson for the Bureau of Mines in the vicinity of Petrolia in October, 1918.

Utah.—In the spring of 1918 a reconnaissance of the geology and water resources of a part of southeastern Utah was made by Prof. H. E. Gregory. The field work was completed soon after the beginning of the present fiscal year, and some progress was made in the preparation of a report on the region.

Virginia.—In the spring of 1918 detailed field work on ground water was begun in parts of the Coastal Plain province in connection with military mapping by the section of Coastal Plain investigations, under the direction of W. T. Lee. Some of the results obtained are to be published later.

Washington.—A report on ground water in Quincy Valley, Wash., by A. T. Schwennesen and O. E. Meinzer, was published as Water-Supply Paper 425–E.

Dominican Republic.—In the spring of 1919 a geologic reconnaissance of the Dominican Republic was made by the United States Geological Survey under the authority of the military governor of the Republic. C. P. Ross, of the ground-water division, was the hydrologist of the exploring party. He left for Santo Domingo on March 20, 1919, and was engaged in field work during the rest of the fiscal year.

DIVISION OF QUALITY OF WATER.

The principal work of the division of quality of water is the mineral analysis of samples of the surface and ground waters of the United States and the interpretation of the analyses to determine how far the mineral content of the waters may affect their domestic use or their use in irrigation or in manufacturing.

During the year the division analyzed 377 samples of water and made computations and classification preparatory to the use of the analyses in reports. This number includes about 50 analyses made for the War and Navy departments as a part of reports on the quality of water required for troops, munition plants, boiler supplies, laundry supplies, and other purposes.

The division also spent considerable time in the technical criticism of 29 reports on quality of water prepared in other divisions. About 300 analyses made outside the Survey have also been computed and classified.

A report on "The nature and cause of calcareous deposits in the water-supply system of Port au Prince, Haiti," was prepared for the Navy Department by A. A. Chambers, besides several other reports to the War Department on the quality of water at numerous localities. Mr. Chambers has made considerable progress in the preparation of analytical data to be used in a report by him on the ground waters of Mississippi.

In considering certain problems connected with the mineral analysis of water C. H. Kidwell devised methods that considerably increase the accuracy of the analyses and save much time in the laboratory work.

DIVISION OF POWER RESOURCES.

The division of power resources has for its function the investigation of power development and utilization. It studies methods of converting natural source of energy into mechanical and electrical power, to the end that the permanent sources, such as water power, may be more fully utilized and the exhaustible sources, such as mineral fuels, may be wisely used and the life of the deposits prolonged. Accordingly this division collects and compiles information showing the magnitude and distribution of water-power sites and fuel deposits, placing special emphasis on the relative importance of the sources from which energy is obtained and giving due consideration to future requirements of energy. The utilization of mechanical and electrical power in various industries and the production of machinery for power development have also received some consideration.

In the performance of this work both statistical and engineering investigations have been required. The statistical work undertaken during the year was the collection of information concerning the installed capacity, fuel requirements, operation, and output of electric-power plants. As a basis for this work a list of all concerns engaged in business as electrical utilities has been compiled.

The engineering work of the division has consisted of the investigation of specific power problems and the preparation of reports thereon and the formulation of plans to remedy faults and to improve power service. Some of the problems studied during the war period were reported shortages of power and poor power service affecting the production of war necessities, especially in the mining of coal; economies to be gained by interconnection of electric power stations; opportunities for the substitution of water power for fuel power; installation of additional generating equipment of power plants; increase of facilities for water storage and for use of stored water to increase the production of power by hydroelectric plants; the feasibility of financing and constructing new water-power developments; and the obtaining of licenses for the purchase of construction materials and generating equipment required for such developments.

During most of the year the work of the division was done in cooperation with the Bureau of Conservation and the Bureau of Statistics of the United States Fuel Administration. At the time of its organization the Bureau of Conservation was without a force of field engineers, and it was therefore advantageous to use in the investigations of such problems as arose the services of the engineers of the Geological Survey. Accordingly a cooperative agreement was made in the spring of 1918 by which Survey engineers were detailed to the Fuel Administration whenever specific problems required investigation.

Under the terms of this agreement there was a rapid expansion of the engineering work of the division of power resources, which continued until the armistice was signed. After the armistice, however, the necessity for rigid measures of conservation passed, and under date of November 18 the Bureau of Conservation requested that further investigations be undertaken only when they might directly contribute to the saving of fuel during the winter of 1918–19 and that other investigations in progress be terminated as soon as practicable. On November 22 Dr. H. A. Garfield, United States Fuel Administrator, suggested that the part of the work of the Fuel Administration relating to the development of power that might be of value to the country in time of peace be continued by the Survey, and on December 11 the Survey expressed its willingness to take over and carry on such features as appeared to have permanent usefulness. During the month of January this cooperation was concluded, as the Bureau of Conservation ceased its activities on January 15.

For the Bureau of Statistics of the Fuel Administration the Geological Survey undertook to ascertain the fuel requirements of electrical utilities and to assist in obtaining and compiling weekly reports showing their consumption of fuel. As an aid in fuel conservation and to assist in determining the conditions of power supply the division of power resources requested that electrical utilities report also their production of electric power. Statistical inquiry was also made concerning the conditions of power production in private electric plants. This cooperative arrangement with the Bureau of Statistics was continued until February 1, 1919, when the division of power resources took over the statistical work relating to the consumption of coal by electrical utilities and the production of electric power.

The personnel of the division has varied throughout the year in accordance with the requirements of the work. Six employees of the Geological Survey were regularly employed in the Washington office, and four clerks were detailed from the Fuel Administration to assist in work of the division. The engineering investigations have in general been conducted by the engineers in charge of the district offices of the water-resources branch. When it became evident that there would be a marked shortage of power throughout the country 13 engineers were appointed to make engineering investigations in the field. Most of these engineers were engaged in consulting practice, but all accepted appointment at a per diem salary as an opportunity for patriotic service. The following engineers accepted such appointment: Howard T. Critchlow, Trenton, N. J., Alger A. Conger, Worcester, Mass.; G. F. Harley, Columbus, Ga.; Fred H. Vose, Cleveland, Ohio; Elmer J. McCaustland, Columbia, Mo.; Francis J. Seery, Ithaca, N. Y.; H. N. Sulliger, Santa Monica, Cal.,

Timothy R. Atkinson, Bismarck, N. Dak.; Clinton B. Stewart, Madison, Wis.; Roy C. Brett, Cleveland, Ohio; Chester S. Colson, New York City; Horace W. King, Ann Arbor, Mich.; John C. Stevens, Portland, Oreg. To assist in the statistical work of the division additional temporary clerks and stenographers were detailed by the Fuel Administration, reporting for duty in the evening. The number of such clerks at the period of maximum activity was about 50.

The engineering work of the division revealed many opportunities for the conservation of fuels and the increase in electric power supply for war necessities. During the first part of the fiscal year and up to the signing of the armistice over 50 field investigations had been undertaken by the division, and a large number of reports had been submitted to the Fuel Administration. Reports were also made for the War Industries Board, the Capital Issues Committee, and the War and Navy departments. Some of the typical investigations made and results accomplished are stated below.

An examination and study of the generation and use of power in and around Albany, N. Y., indicated that much coal could be saved by making use of existing interconnections of electric power plants made primarily for use in emergencies by utilizing more completely a large hydroelectric plant, and by using for generating power water that was stored for navigation. As a result of a conference at Albany of State officials and representatives of the power companies, of the division of power resources, and of the Fuel Administration, arrangements were made to utilize the interconnections of certain power plants and to replace steam power with water power. The plan was placed in operation October 23, 1918, with an estimated saving of over 50,000 tons of coal a year.

Investigations were made in New England with a view of developing and utilizing stored water to increase the power available at hydroelectric plants in the Connecticut River basin. A report was made to the Capital Issues Committee on the request of the city of Watertown to issue bonds to complete a water-power development in connection with the city waterworks.

The power service furnished by the Central Illinois Public Service Co. to the coal mines in southern Illinois was investigated, and a peculiarly difficult power shortage was adjusted equitably to the power users by placing a representative of the Fuel Administration in the load dispatcher's office of the power company. The company was also assisted in obtaining material and equipment for repairing and enlarging one of its power plants.

The municipal power plant at Nashville, Tenn., was shut down because it was shown that coal would be saved by purchasing power from a hydroelectric plant. A report was made on the conditions of the water-power plants utilizing water from the power canal at

Augusta, Ga. The Navy Department was furnished with maps showing the location of transmission lines and power plants for use in selecting a site for a wireless station in South Carolina. An investigation and detailed report was made on the possibility of saving fuel in the St. Paul-Minneapolis district, in Minnesota. Investigation of duplication of power plants at Grand Island, Nebr., showed that about 7,000 tons of coal a year could be saved by interconnection and action was taken accordingly. As a result of an investigation of power furnished to coal mines at Sheridan, Wyo., emergency installation of additional generating equipment was recommended and assistance was given to the power company in procuring the equipment required. A report was made on the desirability of interconnecting the plants of the Spokane Light & Power Co., Spokane, Wash., and the Washington Water Power Co. A report was prepared showing the quantity of coal that would be saved by utilizing the water power at the Austin dam, Texas.

The quantity of fuel that can be saved at any operation or plant can not always be determined definitely by such investigations, but the aggregate quantity of fuel conserved by the work done was undoubtedly large, and the saving had a material effect on the coal supply. With the signing of the armistice the tremendous demand for power and fuel rapidly subsided, and no additional measures of fuel conservation were necessary.

The statistical work done included the obtaining of reports and the compilation of returns showing the coal consumed by electric utilities during the years 1916, 1917, and 1918. Preliminary estimates of the consumption for 1918 were furnished to the Bureau of Statistics of the Fuel Administration in June, 1918, and a final report was transmitted in December. Reports were prepared and published on the production of electrical power in the United States, showing the power derived from water and that derived from fuels and the quantities of fuels consumed for this purpose during the months of February and March, 1919.

As a basis for further studies of power production it was found necessary to prepare maps showing the location of power plants and transmission lines. Numerous power companies were requested to furnish blue prints giving such information as was available to show the location of their lines and their switching connections. Where no maps were available topographic sheets of the Geological Survey were sent to the companies for use in furnishing the information. Through this work, which has been in charge of Guy D. Thomas, a large amount of valuable material has been collected, and considerable progress has been made in the preparation of the maps. Maps of New Hampshire, Vermont, and New York are being printed; maps of Massachusetts and Virginia are practically compiled; and progress

has been made on maps of Connecticut, Rhode Island, North Carolina, South Carolina, Alabama, Ohio, Indiana, and Illinois.

In order to obtain a statistical measure of the progress of water-power development the manufacturers of water wheels were requested to furnish to the Geological Survey information concerning their shipments of wheels and the orders they received. The manufacturers furnished the information desired, and a report showing the number of water wheels manufactured and shipped in 1918 was prepared and will be published shortly.

A large amount of valuable statistical information relative to the private electric power plants of the United States was obtained in cooperation with the Fuel Administration, but the force available has not been sufficient to analyze and compile the statistics furnished. Two card indexes of electric-power concerns have been prepared, however, one segregated by States and the other arranged in alphabetic order. These indexes are believed to be the most complete lists of producers of electric energy in the United States. The names of all companies operating as electric utilities have been put on addressograph stencils, so that it is possible to send out requests for information from such companies with a minimum of effort.

DIVISION OF ENLARGED AND STOCK-RAISING HOMESTEADS.

About 100 men were employed in examining lands applied for under the enlarged and stock-raising homestead acts until November, 1918, when, because of the depletion of the appropriation, the force was reduced to 25 and transferred to the Washington office, where the men prepared and reviewed reports and participated in conferences with the land-classification board.

During the season of 1918 applications pending in the land districts of the following States were examined: Utah, all districts; Arizona, all districts; Washington, all districts; California, north half of the San Francisco and Sacramento districts, all of the Independence, Los Angeles, and Eureka districts, and about half of the Susanville district; Oregon, all districts except one-third of The Dalles district; Idaho, the Lewiston district and half of the Hailey district; Colorado, the Montrose, Durango, Denver, and Pueblo districts; Wyoming, the Lander district and four-fifths of the Evanston district; Montana, all districts except Kalispell and parts of the Miles City, Lewistown, and Great Falls districts; Oklahoma, the Guthrie district.

At the end of the fiscal year the field force was being reorganized in order to resume the field work as soon as the appropriation for the ensuing year should become available.

LAND-CLASSIFICATION BOARD.

ORGANIZATION AND PERSONNEL.

The land-classification board consists of a division of mineral classification, the work of which pertains to lands valuable for coal, oil, phosphate, and various other minerals, and a division of hydrographic classification, organized in three sections, one pertaining to water-power lands, one to irrigated and dry farming lands, and one to stock-raising homesteads. Technical men attached to other branches of the Survey act in consultation with the board on matters of classification involving the work upon which they are engaged.

The organization and personnel at the end of the year were as follows:

Chief of branch: W. C. Mendenhall, geologist.

Secretary of board: Elsie Patterson.

Division of mineral classification: E. H. Finch, geologist, acting chairman; R. W. Howell, geologist; N. W. Bass, assistant classifier.

Division of hydrographic classification: Herman Stabler, chief engineer, in charge.

Power section: R. W. Davenport, hydraulic engineer, chairman; R. M. Davis and N. J. Tubbs, engineers; D. J. Guy, assistant engineer.

Irrigation section: J. F. Deeds, engineer, chairman; F. J. Sopp, W. N. White, and F. B. Howe, classifiers; C. E. Nordeen, assistant topographer.

Grazing section: A. E. Aldous, classifier, chairman; G. W. Holland, classifier; J. G. Mathers, assistant engineer; W. L. Hopper, assistant classifier.

The force at the end of the year included also 38 other employees of various grades. During the year there were 22 additions to and 18 separations of employees on the permanent roll, and about half a dozen temporary clerks were engaged at different times. For six months of the winter period about 20 classifiers normally engaged in field examinations under the stock-raising homestead law were assigned to office work in connection with the classifications based on their field work.

FUNDS.

The work of the board for the fiscal year was supported by the following allotments from the appropriations made to the Survey:

Geologic surveys, etc	$23,000
Topographic and forest surveys	8,000
Gaging streams	7,000
Enlarged and stock-raising homesteads	55,000
	93,000

SUMMARY OF WORK OF CLASSIFICATION.

During the year 6,439 acres of land were classified as to their coal character. Of this amount 2,736 acres were classified as noncoal land and 3,703 acres as coal land. Coal-land withdrawals during the year amounted to only 2,415 acres, and coal-land restorations to

3,331,522 acres. The area withdrawn for classification as to coal at the end of the year was 40,428,381 acres.

Net withdrawals of probable oil lands amounting to 239,946 acres were made during the year, and an area of 931 acres was restored because examination determined that the lands were not favorable for the accumulation of oil. The result of the year's work, therefore, has been an increase of the area of oil reserves from 6,519,819 acres to 6,758,834 acres.

The net result of withdrawals and restorations of oil-shale lands has been to reduce the oil-shale reserves 3,754 acres, leaving 128,267 acres in existing reserves, practically all of which are reserved for the use of the Navy. In addition to this, 129,421 acres have been classified as to oil-shale content. Of this area 4,080 acres were classified as nonmineral land and 125,341 acres were classified as lands valuable as a source of petroleum and nitrogen. There is now a total area of 4,117,377 acres classified as oil-shale land and valuable for mineral. This, with the 128,267 acres of land withdrawn, gives a grand total area of oil-shale land classified or withdrawn of 4,245,644 acres.

No action was taken in respect to phosphate lands, and the area included in phosphate reserves remains the same as a year ago, 2,724,394 acres.

No further potash reserves were created during the year, but the existing reserves were reduced by the restoration of 440 acres, leaving outstanding reserves of 130,029 acres.

Withdrawals of lands believed to be valuable for power sites aggregated 7,392 acres, and restorations of lands previously withdrawn, because they were found to be without value for power and for other reasons, amount to 6,037 acres, the net effect upon reserved areas being an increase from 2,564,372 to 2,565,727 acres. The only change in power-site designations during the fiscal year was the cancellation of a power-site classification of 6,355 acres in Arizona, the total area so designated in that State being reduced to 758,083 acres.

The Secretary of the Interior, upon recommendation of the Geological Survey, designated 8,452,637 acres of land as nonirrigable under the enlarged-homestead act during the year, and designations of an area of 5,254 acres were canceled on information received indicating that the lands are irrigable and therefore not properly designated as nonirrigable. The net increase in the area classified under these acts was 8,447,383 acres, and the total area so classified on June 30, 1919, was 288,797,241 acres. These areas include 3,400 acres in Idaho designated under the nonresidence provisions of the enlarged-homestead act during the year. The total designations under the nonresidence provisions of the acts, on June 30, 1919, amounted

to 512,837 acres in Idaho and 1,424,274 acres in Utah; 5,415 petitions for designation under these acts were pending at the beginning of the year, and 3,512 were received during the year. Of this total of 8,927, 4,806 were acted upon, leaving 4,121 cases pending on June 30, 1919. During the period 434 other cases were reconsidered.

At the end of the year 20,181,868 acres had been designated as subject to entry under the stock-raising homestead law of December 29, 1916 (39 Stat., 862), as the result of field examination and office study. The number of applications pending on June 30, 1918, was 34,649, and during the year 14,248 other applications were received, making a total of 48,897 in hand for consideration. Of this number 29,176 were disposed of during the year, leaving 19,721 cases for consideration at its close.

The area added to public water reserves during the year was 22,422 acres, and the area eliminated from such reserves was 1,375 acres. The net increase in the area thus reserved was from 204,634 to 225,681 acres.

CORRESPONDENCE.

During the year 27,255 letters and petitions were received by the land-classification board. This is a decrease of about 60 per cent from the number for the preceding fiscal year. This large decrease does not, however, indicate an abnormal reduction in the general annual volume of the board's correspondence. The year 1917–18 was in itself unusual, inasmuch as the passage of the stock-raising homestead act on December 29, 1916, was followed by a very large influx of petitions for designation of lands under this act, which increased the correspondence by 157 per cent over that of the preceding fiscal year. The correspondence for the year 1918–19 is a return to the average for the last few years, with this exception. In addition to the correspondence listed, 2,485 copies of letters, decisions, etc., from various bureaus were sent to the board for its information and filing; this material is largely made up of General Land Office letters to its local officers and of reports on the character of lands by its inspectors and agents; coal and homestead receipts; and departmental decisions.

Within the same period 15,382 letters and reports were prepared in the board. This is an increase of 43 per cent over the output of last year.

For the working days of the year, these figures indicate daily receipt of about 89 and daily dispatch of about 50 pieces of mail.

PUBLICATIONS.

No general publications have been issued during the year, but supplemental mimeographed lists showing current withdrawals and restorations of oil lands have been prepared and issued. These, with

Press Bulletin 355, published February, 1918, and Press Bulletin 363, published April, 1918, as supplements to Bulletin 623, "Petroleum withdrawals and restorations," cover all except the most recent actions. There has also been issued a mimeographed list of oil-shale lands in Colorado, Utah, and Wyoming, classified as mineral lands and valuable as a source of petroleum and nitrogen. This list includes all lands that have been so classified.

COOPERATION WITH GENERAL LAND OFFICE.

The cooperation with the General Land Office, under which reports are submitted by the Survey containing information as to the mineral value and water resources of lands for which applications under the public-land laws have been filed, was continued unchanged during the year. Similar cooperation exists with the Indian Office. In addition to 1,532 requests for information as to the mineral character, power value, and value for public watering places pending June 30, 1918, 5,034 such requests were received during the fiscal year. Of these requests 4,259 were acted upon, leaving 2,307 awaiting action at the end of the year.

At the beginning of the year 295 requests for information as to mineral character only were pending, and during the year 1,665 such cases were received. Reports were made in 971 of these cases, leaving 989 cases pending at the end of the year.

During the year 151 requests for report as to water resources only were received, and 35 cases were pending at the beginning of the year. Reports were submitted in 151 cases, leaving 35 cases pending June 30, 1919.

The Survey also furnished to the General Land Office reports upon the feasibility of irrigation projects and proposed power developments under the terms of the general cooperative plan between the two bureaus. Closely related to this cooperation is the duty of the Survey to classify land under the enlarged and stock-raising homestead acts and to prepare appropriate orders for departmental approval designating lands under those acts. The number of cases requiring such action which have been received and the number considered by the Survey are set forth in the following summary:

General summary of cooperative cases.

Classes of cases.	Pending June 30, 1918.	Received during year.	Disposed of during year.	Pending June 30, 1919.	Gain (+) or loss (−).
Mineral character only:					
General Land Office requests for information	20	554	144	430	−410
General Land Office field-service reports	212	899	667	444	−232
Applications for classification as to minerals	63	212	160	115	−52
	295	1,665	971	989	−694
Water resources only:					
General Land Office requests for information	1	10	6	5	−4
General Land Office field-service reports	12	12	12	12	.....
Cases in national forests	4	30	32	2	+2
Applications for reclassification as to water resources	18	99	101	16	+2
Applications for rights of way	46	160	168	38	+8
Lists under Carey Act	.....	3	3	.....	.....
Reports of irrigating projects	34	41	72	3	+31
Applications under enlarged-homestead acts	5,415	3,512	4,806	4,121	+1,294
Applications under stock-raising homestead act	34,649	14,248	29,176	19,721	+14,928
	40,179	18,115	34,376	23,918	+16,261
Mineral character and water resources:					
General Land Office requests for information	1,159	4,290	3,477	1,972	−813
General Land Office field-service reports	235	596	579	252	−17
General Land Office requests for information as to water resources, accompanied by field-service reports as to mineral character	123	113	160	76	+47
Indian Office requests for information	15	35	43	7	+8
	1,532	5,034	4,259	2,307	−775
Grand total	42,006	24,814	39,606	27,214	+14,792

MINERAL CLASSIFICATION.

COAL.

Regulations.—No changes in the coal regulations have been made. All coal valuations continue to be made under the regulations adopted in 1913, as modified on February 16, 1915 (43 L. D., 520), requiring classification to be made by quarter-quarter sections and surveyed lots.

Timber values.—By the decision of Charles D. Mahaffie, solicitor of the Department of the Interior, dated December 23, 1918, it was held that, "under the law as it now stands, there is vested in the department the power and authority in connection with the appraisal of timbered coal lands to take into consideration and include the timber value as an element in the appraised selling price of the land." In accordance with this decision steps have been taken to secure, by cooperation with the Forest Service of the Department of Agriculture, equitable timber valuations of classified coal lands lying within national forests, but as yet no appraisals embracing combined coal and timber values of such lands have been made.

Withdrawals and restorations.—The total area of coal lands withdrawn during the year was only 2,415 acres. The tracts included in this withdrawal were coal lands in Colorado which had reverted to the United States through cancellation of patents. Withdrawal

was made to protect the lands from coal entry pending an examination and appraisal of their coal value. A total of 3,331,522 acres, the classification and appraisal of which was completed, was restored and made available for purchase under the coal-land laws. Of this restored land 3,329,886 acres is in North Dakota, and the remainder is scattered through four States. With the exception of the large restoration of North Dakota coal lands, the cancellation of withdrawals was practically at a standstill during the year, owing both to the lack of necessary field data for classification and to the diversion of effort to other and more pressing channels.

The following table shows the results of the year's work:

Coal withdrawals and restorations, fiscal year 1918–19, in acres.

	Outstanding June 30, 1918.	New withdrawals 1918–19.	Restorations 1918–19.	Outstanding June 30, 1919.
Arizona	141,945			141,945
California	17,643			17,643
Colorado	4,498,376	2,415	280	4,500,511
Idaho	4,761			4,761
Montana	10,612,112		80	10,612,032
Nevada	83,833			83,833
New Mexico	5,586,244		1,036	5,585,208
North Dakota	14,232,501		3,329,886	10,902,615
Oregon	4,361			4,361
Utah	5,314,075		240	5,313,835
Washington	824,074			824,074
Wyoming	2,437,563	160		2,437,723
	43,757,488	2,575	3,331,522	40,428,381

Classification.—Field examination for the purpose of classification as coal land or noncoal land of areas included in existing coal withdrawals was limited entirely to a few small tracts the restoration of which was especially urgent. No general examinations of coal land were undertaken during the year because of the war conditions, and the new classifications based on field examinations made during the year comprised but 4,379 acres; the reclassification of 2,060 acres brought the total area classified during the year to 6,437 acres. Coal classifications in Colorado, Montana, Nevada, New Mexico, North Dakota, and Utah constituted 3,143 acres of this total, and classifications as noncoal land in Colorado, Montana, and North Dakota the remaining 1,236 acres.

In the first of the following tables the classifications made during the year are summarized by States. In the same table the classifications are divided into two groups—reclassifications, which constitute a revision of previous classifications, and new classifications, which comprise the classifications of withdrawn areas or areas not previously considered. The sum of classifications in these two groups represents the total classification. The net increase or decrease in total areas classified in any State, as shown in the last two columns,

is obtained directly from the other columns of the table. The two succeeding tables show the result of the actions given in the first table as they affect outstanding classifications (second table) and as they affect outstanding appraisals (third table).

Land classified as coal and noncoal land, fiscal year 1918–19, in acres.

State.	Total classification.			Reclassification.		New classification.		Net increase or decrease.	
	Coal.	Noncoal.	Total.	Previous noncoal, now coal.	Previous coal, now noncoal.	Coal.	Noncoal.	Coal.	Noncoal.
Colorado	120	160	280	.....	.....	120	160	120	160
Montana	1,580	2,476	4,056	1,420	460	160	2,016	1,120	1,056
Nevada	923	.....	923	.....	.....	923	.....	923	.....
New Mexico	640	.....	640	.....	.....	640	.....	640	.....
North Dakota	80	100	180	80	100	.....	.....	20	20
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Utah	240	.....	240	.....	.....	240	.....	240	.....
Wyoming	120	.....	120	.....	.....	120	.....	120	.....
	3,703	2,736	6,439	1,500	560	2,203	2,176	3,143	1,236

Classification of coal and noncoal land, June 30, 1919, in acres.

State.	Classification outstanding June 30, 1918.		Net results of classification, 1918–19.		Classification outstanding June 30, 1919.		
	Coal.	Noncoal.	Coal.	Noncoal.	Coal.	Noncoal.	Total.
Arizona	.....	42,492	.....	.....	.....	42,492	42,492
Arkansas	60,715	70,038	.....	.....	60,715	70,038	130,753
California	8,720	228,502	.....	.....	8,720	228,502	237,222
Colorado	3,366,353	9,357,330	+ 120	+ 160	3,366,473	9,357,490	12,723,963
Idaho	4,603	8,272,256	.....	.....	4,603	8,272,256	8,276,859
Montana	5,896,759	21,803,316	+1,120	+1,056	[a]55,897,805	[a]21,804,357	[a]27,702,162
Nevada	5,880	2,428	+ 923	.....	6,803	2,428	9,231
New Mexico	683,517	3,753,000	+ 640	.....	684,157	3,753,000	4,437,157
North Dakota	11,409,789	2,847,334	− 20	+ 20	11,409,769	2,847,354	14,257,123
Oregon	17,444	1,062,095	.....	.....	17,444	1,062,095	1,079,539
South Dakota	244,874	6,961,357	.....	.....	244,874	6,961,357	7,206,231
Utah	1,087,752	3,307,091	+ 240	.....	1,087,992	3,307,091	4,395,083
Washington	149,426	1,584,849	.....	.....	149,426	1,584,849	1,734,275
Wyoming	7,413,384	15,491,090	120	.....	7,413,504	15,491,090	22,904,594
	30,349,216	74,783,178	+3,143	+1,236	30,352,285	74,784,399	105,136,684

[a] The resurvey of a land net of one township in Montana caused a reduction of 74 acres of coal land and 15 acres of noncoal land, or a total reduction of 89 acres of land previously classified.

Area and valuation of coal lands June 30, 1919.

State.	Appraised coal land June 30, 1918.	Coal land appraised, 1918–19.		Net result of appraisals, 1918–19.	Total appraisals coal land outstanding June 30, 1919.	Total valuation of appraised coal land outstanding June 30, 1919.	Average value per acre.
		Total coal land appraised.	Coal land reclassified as noncoal land and rewithdrawn.				
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*		
Arkansas	60,715				60,715	$1,473,762	$24.27
California	7,720				7,720	585,086	75.70
Colorado	2,881,374	+ 120		+ 120	2,881,494	195,531,620	67.86
Idaho	4,603				4,603	89,624	19.47
Montana	5,782,216	+1,580	+460	+1,120	5,783,336	137,410,916	23.76
Nevada	5,880	+ 923		+ 923	6,803	126,830	18.64
New Mexico	665,565	+ 640		+ 640	666,205	16,392,111	24.61
North Dakota	11,409,789	+ 80	+100	− 20	11,409,769	199,382,266	17.47
Oregon	7,195				7,195	[a] 174,843	24.30
South Dakota	244,874				244,874	2,711,462	10.07
Utah	1,069,631	+ 240		240	1,069,871	45,101,333	42.16
Washington	1,866				1,866	38,520	20.64
Wyoming	7,238,515	120		120	7,238,635	387,820,153	53.58
	29,379,943	3,703	560	3,143	29,383,086	986,828,526	33.59

[a] Coal values in Oregon were automatically increased $46,792 as a result of the completion of a railroad to a point within 15 miles of one of the coal fields.

Applications for classification as to coal.—During the year the Survey received 69 applications for classification, 51 of which were requests for classification as coal land and 18 as noncoal land. At the beginning of the year 35 applications for coal classification and 2 for noncoal were pending. Of the total 106 received and pending cases, 58 were acted on—41 as coal and 17 as noncoal. At the end of the year 48 requests for classification were pending, of which 45 were for coal and 3 for noncoal.

OIL.

Field investigation of prospectively valuable oil and gas territory was greatly curtailed during the year as a result of the diversion of personnel and funds to problems more directly contributing to war efforts. None of the areas examined were considered sufficiently promising to warrant withdrawal. Two withdrawals were made during the year, however, one of 135,503 acres in Colorado and another of 98,657 acres in Wyoming. These withdrawals, which were recommended during the preceding fiscal year on the basis of previous field work, were not promulgated until the present year.

A total of 931 acres of land in Wyoming previously included in outstanding petroleum reserves was eliminated from withdrawal because reconsideration of available information indicated the nonoil character of the land. The following table summarizes the year's work and shows the areas, by States, of the present outstanding petroleum reserves:

Oil withdrawals and restorations, fiscal year 1918-19, in acres.

State.	Withdrawals outstanding June 30, 1918.	New withdrawals, 1918–19.	Restorations, 1918–19.	Withdrawals outstanding June 30, 1919.
Arizona	230,400			230,400
California	1,257,229			1,257,229
Colorado	87,474	135,503		222,977
Louisiana	467,030			467,030
Montana	[a] 1,351,891			[a] 1,351,891
North Dakota	84,894			84,894
Utah	1,962,787			1,962,787
Wyoming	1,083,900	98,657	931	1,181,626
	6,525,605	234,160	931	6,758,834

[a] This item is 5,786 acres greater than was given in the report for the preceding fiscal year. The discrepancy is the result of an error in computing the acreage of a withdrawal in Montana made and reported during the last fiscal year. The withdrawn area in Montana outstanding June 30, 1918, should have been reported as here given.

Classification.—Aside from work conducted wholly by the geologic branch on the lands of the Osage Reservation, Okla., there has been no classification of oil land during the year, nor has any public land been so classified with the exception of certain early classifications of California lands. Except for occasional classifications, as mineral land prospectively valuable for oil or gas, of areas within Indian reservations and hence not subject to the provisions of the withdrawal act, it is the present policy of the department to withdraw rather than classify lands on which oil is known or believed to be present in commercial quantities. Lands withdrawn are so held until further detailed examinations shall have determined their mineral character or until legislation providing for their disposition by lease or otherwise is enacted. Lands included in oil withdrawals may therefore be considered tentatively as oil lands, although, with the exception of the early California classifications previously mentioned, they have not been formally so classified.

Further field work on the oil shales of the Western States showed that certain areas not previously acted upon contained deposits of rich oil shale. As a result of these investigations, 56,221 acres in the Debeque district, Colo., were classified as mineral lands valuable as a source of petroleum and nitrogen, and 4,080 acres in the same region previously classified as oil-shale lands were found to have insufficient mineral value to warrant this classification and were accordingly reclassified as nonmineral lands. The classified oil-shale lands of Utah were also increased by the addition of an area in the Uinta Basin extending northward toward the Colorado State line from the area previously classified. Field evidence having shown these lands to be underlain by valuable oil-shale deposits, 69,120 acres were classified as mineral land. The total area of oil-shale land classified as mineral land, including areas previously classified, is 4,117,377 acres.

Applications for classification.—During the year the Survey received 12 applications for classification as nonoil lands. At the beginning of the year 1 application was pending, making a total for the year of 13 cases. Six of these cases were acted on during the year, and 7 remained pending at the end of the year.

POTASH.

Reconnaissance work in search of commercial deposits of potash was continued by the geologic branch during the year, and special investigations were made of certain areas selected for inclusion in extensive proposed prospecting territory under the terms of the potash leasing act (40 Stat., 297). Partly as a result of the geologic work, it was possible to eliminate certain nonmineral lands from the Searles Lake Potash Reserve, and 440 acres in all were restored.

Potash-leasing act.—The act of Congress approved October 2, 1917, entitled "An act to authorize exploration for and disposition of potassium" (40 Stat., 297), authorizes the Secretary of the Interior, in his discretion, to issue permits giving the exclusive right for two years to prospect for chlorides, sulphates, carbonates, borates, silicates, nitrates, and other salts of potassium on not more than 2,560 acres of vacant public land, and to issue leases for the exploitation of the deposits. Patents may be issued for one-fourth of the area covered by a prospector's permit, if a commercial deposit of potash is discovered. Applications for such prospecting permits are submitted to the Commissioner of the General Land Office within whose jurisdiction falls the decision as to granting or refusing the permit. During the year 130 such applications were submitted to the Survey for report and recommendation. At the beginning of the year there were also pending 24 applications, making a total for the year of 154 applications. With the approach of peace and the consequent unsettled conditions of the potash market in anticipation of a decline from the prevailing high market price of potash there was a decided reduction in the number of applications received. Action has been taken on 95 applications, and the remaining 59 were awaiting action at the end of the year.

PHOSPHATE.

Regulations.—No change in the procedure affecting the classification of phosphate land has been made. Under the regulations defining phosphate lands, adopted by the Survey in 1912 to guide its recommendations for withdrawal and restoration, lands underlain by deposits containing less than 30 per cent of tricalcium phosphate are considered nonmineral lands. Phosphate beds that are from 1 foot to 6 feet or more in thickness and contain 70 per cent or more of tricalcium phosphate are held to depths ranging from zero along the outcrop to the maximum of 5,000 feet in direct ratio to the variation

of the thickness of the bed from 1 foot to 6 feet. For beds containing less than 70 per cent of tricalcium phosphate the depth limit varies from zero to the depth of a 70 per cent bed of any given thickness in direct ratio to the variation in tricalcium phosphate content from 30 to 70 per cent.

Withdrawals and restorations.—Field investigation of phosphate deposits was suspended during the year, and as no data warranting either further withdrawals or restorations were at hand, no action was taken. The withdrawals outstanding at the end of the present fiscal year are the same as of June 30, 1917, and are as follows:

Phosphate withdrawals outstanding June 30, 1919.

	Acres.
Florida	119,737
Idaho	1,015,717
Montana	287,883
Utah	302,465
Wyoming	998,592
	2,724,394

Classification.—Examinations of land in Indian reservations are frequently made for the information of the Office of Indian Affairs. If these examinations are made for the purpose of determining whether the lands contain phosphate, the results are transmitted not as withdrawals or restorations but as classifications either as phosphate or nonphosphate lands. Mineral classifications of certain phosphate lands within the Northern Pacific land grant have been reported to the Commissioner of the General Land Office, but these lands are a part of the phosphate reserves and are included in the table just given.

In addition, therefore, to the classifications that are reported as withdrawals and restorations in the preceding list, direct classifications of lands in the Fort Hall Indian Reservation, Idaho, and the Wind River Reservation, Wyoming, have been made. No such action was taken during the fiscal year 1918–19, however. The area of land classified as to phosphate is the same as that outstanding on January 30, 1918, and is given in the following table:

Phosphate classifications of Indian lands outstanding June 30, 1919, in acres.

State.	Phosphate land.	Nonphosphate land.
Idaho	4,080	17,440
Wyoming	20,576	85,515
	24,656	102,955

METALLIFEROUS LANDS.

Classification.—Except for action on cases involving small individual tracts of land which were referred to the Survey by the Commissioner of the General Land Office and which are mentioned under the heading "Cooperation with the General Land Office," no classification of metalliferous lands has been made during the past year.

Withdrawals.—No new areas were withdrawn, and no change was made in the mineral-land withdrawal of 8,507 acres in Arizona.

HYDROGRAPHIC CLASSIFICATION.

WATER POWER.

Withdrawals and restorations.—The classification of the public lands with relation to their value in connection with water-power development was continued during the year, the withdrawals being made under the acts of June 25, 1910 (36 Stat., 847; 36 Stat., 855, 858), and August 24, 1912 (37 Stat., 497). On July 1, 1918, the area included in withdrawals was 2,564,372 acres. During the year 7,392 acres additional were withdrawn and 6,037 acres previously included in power-site reserves were restored to entry. On June 30, 1919, the total area withdrawn in connection with water power was 2,565,727 acres. The definite information regarding the power-site possibilities of much of this area is still very meager, and it is likely that as opportunity is afforded to make detailed examinations in the field considerable adjustment will be necessary.

Power sites withdrawn, restored to entry, and outstanding, fiscal year 1918–19, in acres.

	Withdrawals outstanding June 30, 1918.	New withdrawals, 1918–19.	Restorations, 1918–19.	Withdrawals outstanding June 30, 1919.
Alabama	120			120
Alaska	81,015			81,015
Arkansas	22,354			22,354
Arizona	300,368	701	5,221	295,848
California	277,223	11,749	78	288,894
Colorado	276,514	622		277,136
Idaho	265,467		6,994	258,473
Michigan	1,240			1,240
Minnesota	12,309			12,309
Montana	164,412	27	8	164,431
Nevada	27,361	182		27,543
Nebraska	761			761
New Mexico	62,602			62,602
Oregon	421,972	1,760	988	422,744
Utah	477,628	2,351	1,281	448,698
Washington	113,533		285	113,248
Wyoming	89,493		1,182	88,311
	2,564,372	17,392	16,037	2,565,727

Water-power designations.—The act of June 9, 1916 (39 Stat., 218), revesting in the United States title to lands in Oregon held by the Oregon & California Railroad Co., provides for classification as

"power-site lands" of the revested lands found to be chiefly valuable for water-power sites. The total area classified as power-site lands under the provisions of this act was 141,273 acres on June 30, 1919, there having been no change during the fiscal year.

The act of February 26, 1919 (Public No. 280, 65th Congress), also revested in the United States title to certain lands in Oregon, known as the Coos Bay Wagon Road grant, which has been held by the Southern Oregon Co., and provided for the classification of these lands in the manner prescribed in the act of June 9, 1916, above referred to. No classifications of "power-site lands" have yet been made under this act, although such action has been under consideration.

On July 1, 1918, designation had been made of 764,438 acres of land valuable for water power in Arizona and of 201,000 acres of such land in New Mexico under the provisions of the enabling acts of those States. During the fiscal year cancellations of designations involving 6,355 acres were made in Arizona, reducing the area designated to 758,083 acres; the area designated in New Mexico remained unchanged.

In general, such of the designated lands as were not otherwise withdrawn were also included in power-site reserves under appropriate acts of Congress.

Applications for reclassification.—At the beginning of the year 18 applications for the reclassification of lands included in power-site reserves were awaiting action, and during the year 99 were received, making a total of 117 cases. Action was taken on 101 cases, leaving 16 pending at the end of the year. Of the cases received, over half were from the State of Oregon, and most of these were from the region west of the Cascade Mountains. The remainder of the cases do not apply to any particular region in a materially preponderating degree. The large number of cases in western Oregon is largely attributable to the desires of settlers to acquire certain lands of the former Oregon & California Railroad grant, title to which was revested in the United States under the provisions of the act of June 9, 1916 (39 Stat., 218), and which have been included in power-site reserves.

The following table shows the number of applications for reclassification which have been received each fiscal year since 1910–11

Applications received for reclassification of lands included in power-site reserves.

1910–11	21	1915–16	70
1911–12	32	1916–17	78
1912–13	19	1917–18	90
1913–14	46	1918–19	99
1914–15	49		

It is notable that the number of applications, instead of decreasing from year to year as might be expected with the gradual adjustment of cases of questionable classification, has shown an almost steady

increase. This marks, in large part at least, the increasing manifestation of the demand for a more careful classification of power-site lands. It is to be regretted that action upon these applications has generally been embarrassed by the lack of definite information regarding the power possibilities of lands in power-site reserves. In fact, a similar lack of information has impeded all the Survey's activities in the administration of the water-power resources of the public domain. The investigations of power sites upon the public lands that have been made thus far have been made very predominantly by private interests, and it has been necessary for the Survey to depend largely on information so gathered. It is estimated that in the last 10 years development of the water power on public lands has progressed at a rate that will greatly outstrip their investigation by the Government. Proper administration of the power resources of the public domain requires that the Government shall have sufficient knowledge concerning such resources to be able to direct their development so as to insure the greatest ultimate benefit from them consistent with consideration of the agricultural and other resources of the land. Such a policy urgently demands greater activity in the investigation of the power possibilities of the public lands.

Right of way applications.—Departmental regulations of January 6, 1913, under the act of Congress approved March 4, 1911 (36 Stat., 1235, 1253), and of March 1, 1913, under the act of Congress approved February 15, 1901 (31 Stat., 790), charge the Geological Survey with important administrative duties in connection with applications for rights of way over the public lands for purposes related to the development of water power. Such applications, when received in proper form at the General Land Office, are forwarded to the Survey for consideration of such matters as relative priority of applications, incompatibility of works, relative beneficial utilization of resources, and the engineering and economic features involved in the applications and permits. If the approval of an application is found to be compatible with the public interest, a draft of agreement is prepared, and a report is made to the Secretary of the Interior on the circumstances in the case. This agreement, after execution by the applicant and issuance of the permit by the Secretary of the Interior, defines the conditions under which the power is to be developed, the tenure of the site, and the provisions for the protection of the public interest as regards distribution of output, rates, and service.

During the year favorable reports were made to the Secretary of the Interior on 11 applications for power permits under the act of February 15, 1901, including 3 applications for preliminary and 2 for final permits involving the development of water power and

6 applications for final permits for electrical transmission lines. Favorable reports were also rendered on 11 applications for grants under the act of March 4, 1911, for rights of way for electrical transmission lines.

Several applications involving extensions of time under permits and grants, modifications of stipulations of permittees and grantees, and approvals of transfers of permits and grants have been considered and reported upon to the Secretary. A large amount of correspondence of the Interior Department relative to right of way matters in general has been initiated by the Geological Survey or has been assigned to it for handling.

In pursuance of the Secretary's instructions of August 24, 1916 (45 L. D., 326), 51 permittees under the act of February 15, 1901, and grantees under the act of March 4, 1911, to whom permits and grants have been issued by the Secretary of the Interior since January 1, 1913, were called on for detailed reports of the operations or developments of their power systems during the calendar year 1918. These reports cover the operations of many of the larger power systems of the public-land States and present information which should be of great value in the consideration of the proper working out of Federal administration of water-power development on public lands. The reports show that during 1918, the permittees and grantees generated or transmitted over their systems 3,200,000,000 kilowatt-hours of electric energy. Of this amount 90 per cent was generated by water power and 9 per cent by steam or internal-combustion engines in the systems of the permittees and grantees. The remaining 1 per cent was purchased from outside sources. The average sale price of all energy sold was slightly in excess of 1 cent a kilowatt-hour. Some of the smaller systems which supply the relatively intermittent requirements of small communities received an average of as much as 6 or 7 cents a kilowatt-hour. These reports contain many detailed data concerning the actual operations of power systems which are very valuable in connection with engineering and economic studies relating to power problems.

Some of the permittees and grantees have commented on the multiplicity of reports required by officials of the United States and the States. The suggestion has been made that all these requirements for information should be coordinated and combined in such manner as to reduce to a minimum the burden of preparing reports by public utilities. The labor in the preparation of such reports should be made as small as is consistent with furnishing to authorized officials the information essential for the particular governmental interest represented. In the interest of efficiency this subject is worthy of most careful consideration, and as opportunity is afforded such consideration will be given as being within the general scope of the in-

structions of the Secretary. It was not found to be practicable during the year to inspect any of the power projects of permittees and grantees.

The Survey has continued the accumulation of information regarding power operations affecting public lands under authorization by the Interior Department prior to the issuance of the current regulations and regarding the very numerous power operations upon lands under the jurisdiction of the Interior Department without authorization.

Near the end of the calendar year 1918 it was determined that the annual rentals in force on projects for the development of water power on Interior Department land amounted to $5,763.40. The income from final permits for power development now in force will increase somewhat, because a number of final permittees are under agreement to begin the payment of rentals at different times within the next few years, and others are paying compensation in accordance with a sliding scale, which provides for a gradual increase in the charge from year to year until a maximum is reached at the end of about ten years from the issuance of the permit. The charges for permits and grants for transmission lines amounted to $4,618 a year. The compensation for preliminary permits in force appeared from Survey records to amount to $5,468.05 a year. Thus the total compensation due for permits and grants at that time was at the rate of $15,849.45 a year. The amount of rentals paid to the Interior Department by the permittees and grantees actually operating power systems is equivalent to approximately 3 mills per 1,000 kilowatt-hours generated or transmitted.

In addition to applications for rights of way for hydroelectric development, a large number of applications of other types are referred to the Geological Survey for consideration and report. These embrace applications for rights of way for railroads, under the acts of March 3, 1875 (18 Stat., 482), and March 2, 1899 (30 Stat., 990), affecting public lands and Indian reservations, respectively, on which report is made as to whether or not the construction of the railroad will interfere with power or irrigation development on streams in the vicinity of the right of way; applications for rights of way for irrigation uses, under the act of March 3, 1891 (26 Stat., 1095), on which report is made as to interference with power development, the feasibility of the project, and other features; applications for rights of way across national forests for mining, milling, and municipal purposes, under the act of February 1, 1905 (33 Stat., 628); and a variety of miscellaneous applications for domestic, municipal, mining, and railroad water supply.

Applications for rights of way, fiscal year 1918–19.

	Pending June 30, 1918.	Received, 1918–19.	Acted on, 1918–19.	Pending June 30, 1919.
Railroad: Acts of Congress approved Mar. 3, 1875 (18 Stat., 482), May 14, 1898 (30 Stat., 409), Mar. 2, 1899 (30 Stat., 990), etc.	9	30	32	7
Irrigation: Acts of Congress approved Mar. 3, 1891 (26 Stat., 1095), May 11, 1898 (30 Stat., 404), etc.	7	46	46	7
Power: Acts of Congress approved Feb. 15, 1901 (31 Stat., 790), Mar. 4, 1911 (36 Stat., 1235, 1253), etc	21	23	22	22
Miscellaneous: Acts of Congress approved Jan. 21, 1895 (28 Stat., 635), May 11, 1898 (30 Stat., 404), May 21, 1896 (29 Stat., 127), Jan. 13, 1897 (29 Stat., 404), Feb. 15, 1901 (31 Stat., 790), Feb. 1, 1905 (33 Stat., 628), Mar. 4, 1911 (36 Stat., 1253, 1254), etc.	9	61	68	2
Total number of applications for original consideration	46	160	168	38
Additional applications for reconsideration	15	36	35	16

IRRIGATION.

Irrigation projects.—A new development in connection with irrigation classification work occurs as a result of the irrigation-district law of August 11, 1916 (39 Stat., 506). The first cases under this law were received during the closing months of the year and have not yet been considered. The functions of the Survey with reference to these cases are similar to its functions in connection with Carey Act projects in that reports to the General Land Office are required as to their engineering and economic feasibility. In purpose and effect, however, the law is totally different from the Carey Act. Under the new law the secretary is empowered to approve applications filed by irrigation districts duly organized in any State, and thereafter any unentered public land in the district as well as entered land upon which final certificate has not been issued shall be amendable to the State laws governing the district to the same extent and upon like terms as privately owned lands in the district. The approval of an application by the Secretary in cases of this type is therefore tantamount to a vote by an owner of private land in the district consenting to the district organization and pledging his land for the payment of expenses arising therefrom.

During the year three Carey Act segregation lists were received, and reports were forwarded to the General Land Office in each case. Six cases of this type were submitted by the General Land Office for reconsideration during the year, and supplemental reports were made in each case.

At the beginning of the year 34 cases were pending awaiting reports to the General Land Office under instructions from the Secretary of the Interior of March 15, 1913, relative to irrigation projects whose water rights or shares of stock are presented as evidence of compliance with the requirements of the desert-land act. During the year 41 new cases were received and reports were submitted to the General Land Office in 72 cases, leaving 3 cases pending June 30, 1919. Of the pending cases two are the applications under the act of August 11, 1916 (39 Stat., 506), which have been received and not yet considered.

On June 30, 1918, five cases involving reports as to projects for irrigating land in desert entries were awaiting reconsideration, and during the year three other such cases were received. Seven of these cases have been closed by supplemental report, leaving one unanswered June 30, 1919.

Reservoir withdrawals.—No withdrawals or restorations in connection with irrigation water-storage reservoir-site investigations have been made by the Survey during the year. The following table shows the area of such withdrawals outstanding:

Reservoir withdrawals outstanding June 30, 1919.

	Acres.
Arizona	23,040
Colorado	1,728
Montana	9,080
North Dakota	1,569
Oregon	10,619
Washington	35,943
	81,979

ENLARGED HOMESTEADS.

Classification of lands under the enlarged-homestead acts of February 19, 1909 (35 Stat., 639), June 17, 1910 (36 Stat., 531), June 13, 1912 (37 Stat., 132), March 3, 1915 (38 Stat., 953), March 4, 1915 (38 Stat., 1162), July 3, 1916 (39 Stat., 344), September 5, 1916 (39 Stat., 724), and February 20, 1917 (39 Stat., 925), was continued during the year, sufficient data being obtained to serve as a basis for action in nearly all cases involving lands previously withheld from designation because of reported or suspected irrigation possibilities. The excepted cases in general are those lying within the exterior limits of irrigation projects requiring further investigation.

Action on petitions under the enlarged-homestead acts, fiscal year 1918–19.

State.	Pending June 30, 1918.	Received 1918–19.	Total.	Action taken, 1918–19.					Pending June 30, 1919.	Cases reconsidered.
				All designated.	Part designated.	Refused.	Recalled.	Total.		
Arizona	40	35	75	27	.....	2	2	31	44	14
Arkansas	.....	1	1	.....	.....	.....	.....	.....	1	.....
California	453	172	625	268	5	12	23	308	317	8
Colorado	767	586	1,353	716	8	15	50	789	564	53
Idaho	563	472	1,035	487	18	80	45	630	405	100
Kansas	29	90	119	99	.....	1	4	104	15	12
Minnesota	.....	1	1	.....	.....	.....	.....	.....	1	.....
Montana	521	740	1,261	222	41	56	59	378	883	68
Nebraska	.....	6	6	.....	4	1	.....	5	1	.....
Nevada	37	7	44	.....	.....	2	2	4	40	.....
New Mexico	510	221	731	357	2	9	34	402	329	31
North Dakota	364	125	489	292	20	15	10	337	152	35
Oregon	556	169	725	466	7	59	27	559	166	40
South Dakota	407	123	530	261	15	13	9	298	232	28
Utah	551	197	748	32	3	187	59	281	467	7
Washington	127	104	21	13	2	5	14	34	197	1
Wyoming	490	463	953	608	4	23	11	646	307	37
	5,415	3,512	8,927	3,848	129	480	349	4,806	4,121	434

The general provisions of the acts, which apply in 14 States, permit the entry by one person of 320 acres of "nonmineral, nonirrigable, unreserved, and unappropriated surveyed public lands which do not contain merchantable timber." Entries may be allowed for the surface only of mineral land containing coal, phosphate, nitrate, potash, oil, gas, or asphaltic minerals. As a prerequisite to the allowance of an entry under these acts the land must have been designated by the Secretary of the Interior as not being, in his opinion, "susceptible of successful irrigation at a reasonable cost from any known source of water supply." Under the provisions of sections 6 of the acts of February 19, 1909, and June 17, 1910, applicable in Utah and Idaho only, the Secretary may further designate lands which do not have upon them "such a sufficient supply of water suitable for domestic purposes as would make continuous residence upon the lands possible," and entrymen upon such lands are relieved of the necessity of residence.

Since the enactment of the preference-right amendment to the enlarged-homestead act, on March 4, 1915 (38 Stat., 1162), the entire energy available for enlarged-homestead classification work has been required for considering individual petitions for designation by prospective entrymen. In consequence general designations of large areas are made only in rare instances.

Enlarged-homestead designations, fiscal year 1918–19, in acres.

State.	Outstanding July 1, 1918.	Designations, 1918–19.	Cancellations, 1918–19.	Outstanding June 30, 1919.
Arizona	25,467,643	21,840	.....	25,489,483
California	7,557,873	857,368	.....	8,415,241
Colorado	27,864,474	914,525	640	28,778,359
Idaho:				
Secs. 1–5 and 7	10,062,974	259,925	3,400	10,319,499
Sec. 6	512,837	3,400	.....	516,237
	10,575,811	.....	.....	10,835,736
Kansas	509,834	38,920	.....	548,754
Montana	50,378,065	287,961	120	50,665,906
Nevada	46,304,756	.....	.....	46,304,756
New Mexico	29,988,434	1,531,555	.....	31,519,989
North Dakota	11,631,385	279,986	654	11,910,717
Oregon	18,150,919	788,508	440	18,938,987
South Dakota	15,648,876	252,884	.....	15,901,760
Utah:				
Secs 1–5 and 7	7,501,820	182,375	.....	7,684,195
Sec. 6	1,424,274	.....	.....	1,424,274
	8,926,094	.....	.....	9,108,469
Washington	5,563,938	2,720	.....	5,566,658
Wyoming	21,781,756	3,030,670	.....	24,812,426
	280,349,858	8,452,637	5,254	288,797,241

A set of State maps showing area covered by the designations outstanding June 30, 1919, has been printed.

STOCK-RAISING HOMESTEADS.

The following tables show the status of petitions and the area of land designated as subject to entry under the stock-raising homestead law of December 29, 1916 (39 Stat., 862), which authorizes the

Secretary of the Interior to designate unreserved public lands in any of the public-land States (but not in Alaska) whose surface is chiefly valuable for grazing and raising forage crops and which do not include merchantable timber, are not susceptible of irrigation from any known source of water supply, and are of such character that 640 acres are reasonably required to support a family.

Prior to July 1, 1918, more than 7,500,000 acres had been designated as subject to stock-raising entry in tracts of 640 acres or less; during the year 12,651,226 acres were so designated and designations of 8,320 acres were canceled, leaving 20,181,868 acres designated under the above-mentioned law.

The work has progressed rapidly, a total of 29,176 cases having been finally closed during the year. Of this number more than 22,000 received favorable consideration.

Stock-raising homestead petitions, fiscal year 1918–19.

State.	Pending June 30, 1918.	Received 1918–19.	Total.	Action taken, 1918–19.					Pending June 30, 1919.	Cases reconsidered.
				All designated.	Part designated.	Refused.	Recalled.	Total.		
Arizona	1,111	221	1,332	483	3	336	72	894	438	25
Arkansas	1	.....	1	.....	.....	.....	.....	.....	1	.....
California	2,268	614	2,882	651	.....	371	109	1,131	1,751	8
Colorado	3,183	1,702	4,885	2,361	15	162	311	2,849	2,036	66
Idaho	2,913	645	3,558	708	24	294	259	1,285	2,273	17
Kansas	109	33	142	74	.....	.....	7	81	61	2
Minnesota	.....	1	1	.....	.....	.....	1	1	.....	.....
Montana	7,164	1,756	8,920	3,948	11	925	894	5,778	3,142	84
Nebraska	18	67	85	1	.....	2	1	4	81	.....
Nevada	159	47	206	45	.....	10	19	83	123	.....
New Mexico	7,277	1,816	9,093	4,838	114	1,743	294	6,989	2,104	132
North Dakota	200	73	273	1	1	22	13	37	236	2
Oklahoma	75	58	133	82	.....	11	.....	95	40	.....
Oregon	3,202	886	4,088	1,686	39	200	161	2,086	2,002	9
South Dakota	1,102	1,629	2,731	1,211	6	22	26	1,265	1,466	100
Utah	1,323	262	1,585	92	.....	217	46	355	1,230	1
Washington	673	212	885	378	6	59	46	489	396	.....
Wyoming	3,871	4,226	8,097	5,501	19	170	66	5,756	2,341	69
	34,649	14,248	48,897	22,060	238	4,553	2,325	29,176	19,721	515

Stock-raising homestead designations, fiscal year 1918–19, in acres.

State.	Outstanding July 1, 1918.	Designations, 1918–19.	Cancellations, 1918–19.	Outstanding June 30, 1919.
Arizona	.....	291,120	.....	291,120
Arkansas	.....	240	.....	240
California	.....	365,380	.....	365,380
Colorado	1,432,766	1,250,398	8,200	2,674,964
Idaho	.....	445,389	.....	445,389
Kansas	15,384	42,220	.....	57,604
Montana	55,538	2,346,252	.....	2,401,790
Nebraska	38,648	.....	.....	38,648
Nevada	.....	28,980	.....	28,980
New Mexico	2,188,698	2,894,392	.....	5,083,090
North Dakota	190,797	621	.....	191,418
Oklahoma	.....	22,481	.....	22,481
Oregon	.....	1,041,027	120	1,040,907
South Dakota	1,156,229	626,296	.....	1,782,525
Utah	.....	52,410	.....	52,410
Washington	.....	207,536	.....	207,536
Wyoming	2,460,902	3,036,484	.....	5,497,386
	7,538,962	12,651,226	8,320	20,181,868

PUBLIC WATER RESERVES.

Withdrawals of tracts containing watering places located in regions largely devoid of sources of water supply for stock grazing on surrounding open public range were continued during the year, and many restorations from such withdrawals were also made. These reserves are created under the act of June 25, 1910 (36 Stat., 847), as amended by section 10 of the act of December 29, 1916 (39 Stat., 862), in order that control of the water on the land withdrawn may be retained in the Government. Efforts of private individuals to develop and protect the water supply on such lands from damage and pollution, however, will be encouraged by granting special privileges to such individuals through issuing permits under the act of February 15, 1901 (31 Stat., 790).

Areas amounting to 22,422 acres were included in public water reserves during the year and 1,375 acres were eliminated from such reserves on the basis of information obtained through field examinations by the General Land Office and the Survey.

Public water reserves withdrawn, restored to entry, and outstanding, fiscal year 1918–19, in acres.

State.	Withdrawals outstanding July 1, 1918.	New withdrawals, 1918–19.	Restorations, 1918–19.	Withdrawals outstanding June 30, 1919.
Arizona	13,066	1,080	320	13,826
California	52,474	3,560	.....	56,034
Colorado	480	1,460	40	1,900
Idaho	7,210	.....	170	7,040
Montana	5,264	2,065	45	7,284
Nevada	4,753	80	.....	4,833
New Mexico	2,926	475	40	3,361
Oregon	2,482	9,262	.....	11,744
Utah	34,627	240	.....	34,867
Washington	40	760	.....	800
Wyoming	81,312	3,200	760	83,752
South Dakota	.....	240	.....	240
	204,634	22,422	1,375	225,681

PUBLICATION BRANCH.

DIVISION OF BOOK PUBLICATION.

SECTION OF TEXTS.

During the year 34,948 pages of manuscript were edited and prepared for printing, and proof sheets comprising 3,285 galley proofs and 12,696 page proofs were read and corrected. Indexes were prepared for 25 publications, covering 5,044 pages. The publications of the year are listed and abstracted on pages 491–506.

At the end of the year seven persons were employed in this section. The water-resources branch has continued to render special assistance in preparing copy and reading proof.

SECTION OF ILLUSTRATIONS.

At the beginning of the war period the section of illustrations comprised 15 employees. By the transfer of three employees to the topographic branch for work on military maps and by resignations the force during the year was reduced to 10. As a consequence of this reduction the regular scheduled work has in general been delayed, but the aggregate number of drawings prepared was not less than in some previous years. The number of illustrations prepared was 2,522, comprising 197 miscellaneous maps, 188 photographs, 1,054 diagrams and sections, 943 paleontologic drawings, and 140 miscellaneous illustrations. The illustrations sent to the printer were reproduced by chromolithography, photolithography, halftone engraving, zinc etching, wax engraving, four-color process, and cuts already engraved, a total of 933 subjects. The number of proofs received was 952. At the end of the year material for illustrating 40 reports was on hand.

DIVISION OF DISTRIBUTION.

Editions of 147 new books and pamphlets, 12 reprinted books and pamphlets, 1 new geologic folio, 1 new geologic map, 181 new or revised topographic maps, and 179 reprinted topographic maps, making a total of 521 publications, were received during the year. Many other special pamphlets and forms prepared for administrative use were received and distributed.

The total units of all publications received numbered 558,604 books and pamphlets, 3,873 folios, 95 geologic maps, 945,293 topographic and other maps, a grand total of 1,507,865.

The division distributed 465,826 books, 8,865 folios, and 538,396 maps, a total of 1,013,087, of which 7,964 folios and 325,447 maps were sold. The total amount received and deposited in the Treasury as the result of sales of publications was $22,983.21. The sales of topographic and geologic maps amounted to $22,263.96, of geologic folios to $719.25. The division received and answered 69,897 letters.

DIVISION OF MAP EDITING.

SECTION OF GEOLOGIC MAPS.

Practically no editorial work on geologic folios was done during the year because of the discontinuance of the publication of folios during the war. Toward the end of the year, however, one folio that had been well advanced when work was discontinued was completed and published—Folio 208, Colchester-Macomb, Ill. The Newell (S. Dak.) and Herman-Morris (Minn.) folios were also nearly completed. The draftsmen of the section were employed during the large part of the year in preparing manuscript maps of the United States and of

foreign countries for an atlas of commercial geology. The base maps for Part I of the atlas, which deals with the production of minerals, were transferred to stone, and the geologic data were being prepared for reproduction in colors.

During the year G. W. Stose, the geologist in charge of the section, edited geologically the maps and other illustrations for 36 reports other than folios.

SECTION OF TOPOGRAPHIC MAPS.

At the beginning of the year 143 topographic maps were on hand for publication, and the accessions during the year were 118, making a total of 261 maps. Of these, 2 (Springdale and Maysville, Ohio) were combined in a single map, 180 have been published, 69 are in process of engraving and printing, and 10 have not yet been transmitted to the engraving division. One old map has also been republished in a new edition. Of the maps published (see notices on pp. 38–58), 142 are new maps engraved on copper, 30 are new maps reproduced by photolithography, and 8 (two of them photolithographs) are new combinations of maps otherwise published previously. The following statement shows the comparative status of map editing and map publication on June 30 for the last nine years:

Progress of map publication for nine years ended June 30, 1919.

	1911	1912	1913	1914	1915	1916	1917	1918	1919
Published during the year	86	114	101	102	107	153	95	103	181
In process of engraving and printing	56	65	89	69	87	97	111	121	69
For engraving	95	102	105	114	91	52	19	22	10

The manuscripts edited during the year comprise 83 maps prepared for engraving, 30 maps for photolithography, 4 maps of Army cantonments, 169 maps or sheets for the illustration of 21 Survey reports, and corrections for 129 maps about to be reprinted. The proof read comprises 156 new topographic maps and corrections to 49 old maps. The index maps for 6 circulars of the series 9–323 and for 5 of the State circulars were revised and reprinted.

Four men were employed in this section for nine months and five men for three months.

DIVISION OF ENGRAVING AND PRINTING.

TOPOGRAPHIC MAPS AND FOLIOS.

During the year 140 topographic maps were engraved and printed, including the Maysville and Springdale (Ohio-Ky.) maps combined and printed as one map, the Morning View (Ky.) fractional map combined with and printed as part of the Felicity (Ohio) map, and the Mingo (W. Va.) fractional map printed as part of the Webster Spring (W. Va.) map; 30 new topographic war maps were photo-

lithographed and printed in black and colors; 9 special maps showing Army cantonments were compiled and printed with special texts; and a new map of Rocky Mountain National Park was issued, making a total of 180 new maps printed and delivered. One other map was republished in a new edition.

Corrections were engraved on the plates of 126 maps. Of these maps 104 were intended for reprint editions, 1 was in hand for printing, and 21 were corrected for other purposes. Thirteen photolithographic State maps and 4 photolithographed topographic maps in four colors were corrected and reprinted, and reprint editions of 59 maps in hand at the beginning of the year were completed.

Of the new and reprinted maps 360 different editions, amounting to 945,293 copies, were printed and delivered to the map room. This is an increase of 61 editions and 241,955 copies over the preceding year.

One new geologic folio (Colchester-Macomb, Ill.) was published during the year. The edition of this folio was 3,873 copies. Extra geologic maps of this folio amounting to 140 copies were also delivered.

OTHER GOVERNMENT MAP PRINTING.

The following war work was done for different branches of the War Department and Navy Department and for other branches of the Government: For the General Staff (Committee on Education and Special Training), map of Camp De Lassigny and 14 French mission maps; for the Bureau of Aircraft Production, charts and diplomas for air service radio schools, French map (Commercy), 3 French maps, photographic mosaic of Washington, D. C., and vicinity, and miscellaneous work; for the Department of Military Aeronautics, conventional map signs (British and French), map of Mulberry Island, motor-fuel distillation blank and enlargements of topographic maps; for the office of the Chief of Engineers, 3 French maps (Rethal, Vouziers, Somme-Py), circular map enlarged from three Belgian maps, map of Camp Hancock, Ga., maps of Belgium, and miscellaneous work; for the United States Marine Corps, conventional map signs (British and French); for the Quartermaster Corps, 269 German maps, map of Vailly, France, 5 charts for War Department Document 385, and United States base map; for the Coast Artillery School, Fort Monroe, Va., map of Vailly, France; for the Motor Transport Corps (training branch), instruction charts; for the Chemical Warfare Service (gas-defense division), a large amount of photographic and photolithographic work including editions of 97 diagrams, tracing, charts, etc.; for the Chemical Warfare Service (gas-investigations division), a large amount of photographic and photolithographic work including editions of 817 diagrams, drawings, tracings, etc.; for the United States Lake Survey,

Detroit, Mich., transfers of 5 sheets for progressive military map of the United States; for the Navy Department, diagrams of Curtiss airplane; for the Bureau of Navigation, map showing military camps in the vicinity of Washington for use of naval flyers on Hampton Roads; for the Hydrographic Office, bromide enlargements of 12-sheet map of the Atlantic Ocean; for the Bureau of Construction and Repair, a large amount of photographic and photolithographic work including editions of 276 camouflage designs of ships; for the Department of State, 29 maps of South American countries; for the Council of National Defense, a large amount of photographic and photolithographic work including editions of 434 diagrams, drawings, graphs, etc.; for the United States Food Administration, bromide enlargements of charts and other miscellaneous work; for the United States Fuel Administration, map showing congested manufacturing districts, ruled diagrams, and other miscellaneous work; for the War Trade Board, base map of the world (Mercator projection), editons of diagrams and charts, and other miscellaneous work; for the Central Bureau of Planning and Statistics, a large amount of miscellaneous photographic and photolithographic work; for the Bureau of Mines, under appropriations for war materials investigations, argon-gas investigation, chemical plant No. 4, explosive regulation, and war minerals relief, a large amount of photographic and photolithographic work; for the Bureau of Standards, editions of 381 pages of technical manuscript. On order of the Bureau of Standards, two large position mirrors were ruled in centimeter squares for the use of the Ordnance Department. Miscellaneous war work was also done for the Committee on Training Camp Activities, Department of Labor, United States Shipping Board, National Advisory Committee for Aeronautics, War Industries Board, Service Bureau (Committee on Public Information), Federal Board for Vocational Education, and United States Railroad Administration.

The following war work was done through the topographic branch: Eleven aviation maps; 77 special engraved and photolithographed military maps; map of Camp De Lassigny; plan of destruction; map of Gunpowder Neck (7 sheets); maps of Camp Humphreys, Camp Hancock (4 sheets), Camp Abraham Eustis, Camp Jackson (5 sheets), military post J–18, Mulberry Island, Fort Omaha balloon field (3 sheets); map showing war activities; form (report of military surveys); and other miscellaneous work. For the geologic branch war work was done as follows: Eight maps of South American countries, mineral-reserve maps of Europe (91 sheets), 9 maps of Africa, mineral-reserve maps of Australia and other islands (8 maps), mineral-reserve maps of Latin America (55 maps). Miscellaneous war work was also done for the water-resources branch and the administrative branch.

For the Government Printing Office the following items were printed and delivered: Illustrations for the annual reports of the governor of Alaska, the governor of Hawaii, the Commissioner-General of Immigration, and the Director of National Parks; Census reports, Volume I (Population, general report and analysis), Volume II (Report by States, etc., Alabama to Montana), Volume III (Population, report by States, Nebraska to Wyoming, Alaska, Hawaii, and Porto Rico), Volume V (Agriculture, general report and analysis); reports of the Federal Trade Commission on the fertilizer industry, price of gasoline, packing (Methods of the five packers), and pipe-line transportation of petroleum; Department of Agriculture Bulletin 755; Atlas of American Agriculture, Part I, section 1, Part V, section 1, and Part VIII, section 1; Report on a reconnaissance of the soils, agriculture and other resources of the Kenai Peninsula region of Alaska; Bureau of Mines Bulletin 107; Department of Commerce Special Publication 18; United States Coast Pilot, Sections A and E; American Ephemeris and Nautical Almanac, 1921 and 1922; Geological Survey Bulletins 551, 552, 641–F, 664, 668, 678, 683, 686–B, 686–C, 686–D, 686–E, 686–F, 686–G, 686–H, 686–I, 686–J, 686–K, 686–L, 686–M, 686–N, 686–O, 686–P, 686–Q, 686–R, 686–S, 691–E, 691–F, 691–M, 692–E, 692–G, 710–A, 711–A, Professional Papers 112, 120–H, Water-Supply Papers 427, 428; Mineral Resources 1917, chapters on peat and quicksilver; topographic instructions of the United States Geological Survey. In addition, the following separate illustrations were printed and delivered to the Government Printing Office: For the War Department, Ordnance Pamphlet 216, Orientation for Coast Artillery (Appendix 1 to Part III), conventional map signs for War Document 418 and for report on aerial navigation; for the Navy Department, organization chart—Bureau of Supplies and Accounts; for the Department of State, map of Spitzbergen and Bear Island; for the Alaskan Engineering Commission, plats of three Alaska town sites; for the Department of the Interior, township diagram and plat; for the National Park Service, maps for 8 circulars giving general information regarding national parks, sketch map of Mount Rainier and its glaciers, map showing mountaineering in Rocky Mountain National Park, map showing life zones in Glacier National Park; for the Department of Agriculture, base and outline maps of the United States by counties and States, relief map of United States, maps showing quarantine for Texas fever of cattle, map showing world production, map showing spread of the Mexican cotton boll weevil, and protractor diagrams.

The following work was done for other bureaus and departments: For the General Land Office, 1,242 township plats, 463 mineral plats, plats of 3 town sites, 13 State maps showing enlarged homestead areas, and other miscellaneous work; for the National Park Service,

maps of four national parks, 2 automobile tour maps, 7 automobile guide maps, 2 maps showing proposed enlargements of national parks, automobile wind-shield stickers for eight national parks, fire-warning signs, and other miscellaneous work; for the Department of the Interior, floor plans of new Interior Building, department seal, and miscellaneous work; for the Bureau of Mines, maps of world, charts, diagrams, and other miscellaneous work; for the Reclamation Service, 8 maps of projects, 2 State maps, 17 sheets of the Rio Grande drainage survey, map of Colorado River storage, 5 farm-unit plats, township plats, and diagrams, and miscellaneous work; for the Forest Service, maps of 76 national forests, index maps for districts 1, 2, 3, 4, 5, and 6, 13 proclamation maps of national forests, homestead-entry plats, grazing quadrat sheet, allotment-estimate sheets, triangulation-record cards, statistical-atlas page headings, labels, forms, and other miscellaneous work.

Miscellaneous work was also done for the Interstate Commerce Commission, Office of Indian Affairs, Department of Commerce, Department of Justice, International Boundary Commissions, Bureau of Crop Estimates, Biological Survey, Bureau of Chemistry, Bureau of Entomology, States Relations Service, Weather Bureau, Coast and Geodetic Survey, Bureau of Lighthouses, Smithsonian Institution, Bureau of Foreign and Domestic Commerce, Bureau of Education, and Alaskan Engineering Commission.

This work for various branches of the Government included numerous reprint editions and amounted to about $130,000, for which the appropriation for engraving and printing geologic maps was reimbursed by transfer of credit on the books of the United States Treasury.

Work was also done for the College of Liberal Arts; Northwestern University, Evanston, Ill.; Virginia Geological Survey, Charlottesville, Va.; Iowa Geological Survey, Des Moines, Iowa; and Columbia Planograph Co., Washington, D. C.; and the money received in payment for the work, amounting to $374.60, was turned into the Treasury of the United States to be credited to miscellaneous receipts. On requisition of the Government Printing Office, 299 transfer impressions were made and shipped to contracting printers. Under cooperative agreements, transfer impressions were furnished without charge to the State Geological Surveys of Illinois, Ohio, New York, and West Virginia.

A large amount of miscellaneous work relating to the map publications was also done, including index circulars and lists of geologic folios, topographic maps, and State maps.

Of contract and miscellaneous printing of all kinds, 2,935,543 copies were printed. Including topographic maps and geologic folios a grand total of 3,884,849 copies were printed and delivered during the year, an increase of nearly 20 per cent over the previous year.

PHOTOGRAPHIC LABORATORY.

The output of the photographic laboratory consisted of 19,529 negatives, of which 1,094 were wet, 1,324 dry, 666 paper, and 12,838 field negatives developed; 298 lantern slides; 5,109 negatives made for photolithographers; 4,674 zinc plates; 244 zinc etchings; 89 celluloids; and 52,942 prints, of which 32,240 were maps and diagrams and 20,702 were photographs for illustrations. In addition 961 prints were mounted, and 13 lantern slides and 48 prints were colored, and 24 prints were bleached.

ADMINISTRATIVE BRANCH.

EXECUTIVE DIVISION.

The work of the executive division was of the same general character as during the fiscal year 1918.

Mails, files, and records.—During the year 126,290 pieces of mail, of which 1,797 were registered, were opened and referred. In addition 180,515 letters were received direct by other divisions, making a total of 306,805, an increase of 2.5 per cent compared with 1918.

Of the letters opened in this division, 14,897 contained $24,017.37 remitted for Survey publications, a decrease of 12 per cent in number of letters and a decrease of $3,421.50 in amount compared with last year.

The recording, referring, filing, and mailing of correspondence required the services of 10 clerks. The number of letters mailed through the division was 130,071, a decrease for the year of 9.9 per cent. This number does not include the outgoing registered mail, which numbered 9,705 pieces, nor 384,778 pieces of letter mail sent direct from other divisions. The total for the Survey was therefore 524,554—an increase of 27 per cent for the year.

Personnel.—The roll of Secretary's appointees numbered 967 at the end of the fiscal year, 33 less than at the end of 1918. The total number of changes in the personnel was 1,357, which included 387 appointments, 433 separations, 498 promotions, and 39 miscellaneous changes.

During the year 16,095 days of annual leave and 5,238 days of sick leave were granted, being 71¾ per cent of the amount of annual leave and 23⅓ per cent of the amount of sick leave which it is permissible to grant under the law; 9,239 days of leave without pay were also granted.

Freight and express.—During the year 1,491 pieces of freight and express were handled, of which 545 were outgoing and 946 were incoming.

DIVISION OF ACCOUNTS.

A condensed statement covering the financial transactions of the fiscal year is given below, including disbursements up to August. The unexpended balances of that date largely represent outstanding obligations.

Amount appropriated for and expended by the United States Geological Survey pertaining to the fiscal year ended June 30, 1919.[a]

Title of appropriation.	Appropriation.	Repayments.	Available.	Disbursements.	Balance.
Salaries, office of Director	$31,020.00	.....	$31,020.00	$28,260.50	$2,759.50
Salaries, scientific assistants	29,900.00	.....	29,900.00	29,811.12	88.88
Skilled laborers, etc	15,080.00	.....	15,080.00	15,076.50	3.50
Gaging streams, etc	148,244.10	$32,655.42	180,899.52	179,899.52	1,000.00
Chemical and physical researches	40,000.00	266.88	40,266.88	39,317.61	949.27
Preparation of illustrations	18,280.00	441.21	18,721.21	18,672.07	49.14
Mineral resources of United States	99,414.70	.....	99,414.70	97,498.09	1,916.61
Geologic maps of United States	118,049.00	115,613.20	233,662.20	232,662.20	1,000.00
Books for the library	2,000.00	.....	2,000.00	1,771.19	228.81
Topographic surveys [b]	216,415.60	472,481.64	688,897.24	683,872.77	5,024.47
Geologic surveys	347,073.50	6,896.26	353,969.76	348,144.63	5,825.13
Mineral resources of Alaska	75,000.00	.....	75,000.00	62,009.02	12,990.98
Enlarged and stock-raising homesteads	197,268.60	.....	197,268.60	195,843.30	1,425.30
	1,337,745.50	628,354.61	1,966,100.11	1,932,838.52	[c]33,261.59

[a] In addition to these appropriations $100,000 for Survey publications was contained in the appropriation for printing and binding but not disbursed by Survey officials.
[b] Includes appropriation of $74,219.60 for surveying national forests, which is combined with appropriation for topographic surveys in current appropriation bill.
[c] The larger part of this balance will be used to pay outstanding obligations.

Classification of expenditures by the United States Geological Survey pertaining to the fiscal year ended June 30, 1919.

Appropriation.	Total.	Salaries and wages.	Transportation of persons.	Transportation of things.	Provisions; subsistence and support of persons.	Forage; subsistence and support of animals.
Salaries, office of the Director	$28,260.50	$28,260.50	.....	.....	.....	.....
Salaries, scientific assistants	29,811.12	29,811.12	.....	.....	.....	.....
Skilled laborers, etc	15,076.50	15,076.50	.....	.....	.....	.....
Gaging streams, etc	179,899.52	141,996.87	$7,598.25	$872.15	$9,341.96	$219.57
Chemical and physical researches	39,317.61	29,892.30	1,499.43	84.96	2,221.09	82.18
Preparation of illustrations	18,672.07	18,099.00	.....	.....	.....	.....
Mineral resources of United States	97,498.09	90,834.83	1,180.05	85.64	1,329.22	1.00
Geologic maps of United States	232,662.20	146,987.16	134.09	51.10	105.85	.....
Books for the library	1,771.19	.....	.....	1.80	.....	.....
Topographic surveys	[a] 683,872.77	322,083.41	10,639.33	2,189.95	136,002.97	16,343.95
Geologic surveys	348,144.63	289,806.87	9,993.20	501.59	22,358.08	3,374.59
Mineral resources of Alaska	62,009.02	44,187.91	5,231.75	1,142.20	4,991.14	212.34
Enlarged and stock-raising homesteads	195,843.30	129,406.94	9,659.09	478.52	29,393.34	630.49
	1,932,838.52	1,286,443.41	45,935.19	5,407.91	205,743.65	20,864.12

[a] Includes expenditures made from appropriation for surveying national forests, which is combined with topographic surveys in current appropriations.

Classification of expenditures by the United States Geological Survey pertaining to the fiscal year ended June 30, 1919—Continued.

Appropriation.	Communication service.	Printing, engraving, lithographing, etc.	Fuel; furnishing heat, light, power, etc.	Special and miscellaneous service.	Materials; miscellaneous supplies, etc.	Stationery, drafting, etc., supplies.
Gaging streams, etc	$979.91	$242.65	$97.73	$2,376.63	$1,129.79	$2,214.62
Chemical and physical researches	43.80	66.91	33.77	1,340.95	341.78	782.84
Preparation of illustrations	.05	6.85		301.57	.75	101.64
Mineral resources of United States	1,842.81	157.26	12.36	391.40	15.73	687.08
Geologic maps of United States	27.64	750.00	247.40	3,573.62	3,879.22	48,541.97
Books for the library	2.82					10.75
Topographic surveys	450.01	8,080.07	785.13	65,010.82	6,869.50	4,281.51
Geologic surveys	745.14	943.97	26.90	6,266.37	294.88	1,168.52
Mineral resources of Alaska	137.28	75.60	449.60	2,072.73	271.30	331.21
Enlarged and stock-raising homesteads	536.97	10.30		1,570.29	13.55	863.86
	4,766.43	10,333.61	1,652.89	82,904.38	12,816.50	58,984.00

Appropriation.	Equipment (including live stock).	Rent.	Maintenance, operation, and repair of passenger-carrying vehicles.	Purchase of motor-propelled passenger-carrying vehicles.	Purchase of horse-drawn passenger-carrying vehicles.
Gaging streams, etc	$4,278.63	$1,628.50	$4,405.16	$865.41	$1,651.69
Chemical and physical researches	1,667.44		905.16		355.00
Preparation of illustrations	162.21				
Mineral resources of United States	942.17				18.54
Geologic maps of United States	28,364.15				
Books for the library	1,755.82				
Topographic surveys	17,136.18	455.10	59,963.45		33,581.39
Geologic surveys	2,110.61	10.00	6,971.86	670.21	2,901.84
Mineral resources of Alaska	2,323.96	480.00			102.00
Enlarged and stock-raising homesteads	46.45	110.68	22,036.52	935.20	151.10
	58,787.62	2,684.28	94,282.15	2,470.82	38,761.56

DIVISION OF SCIENTIFIC AND TECHNICAL EQUIPMENT.

The cost of the work and material used in the division of scientific equipment during the year was $23,287.24.

In addition, work amounting to $1,500 was done by the instrument section for the War Department, and work amounting to $1,300 was done on the development of the airplane camera.

LIBRARY.

The accessions of books, pamphlets, and maps numbered 13,057 items, which were recorded in the catalogues. The recorded loans were 7,959 books and 913 maps, not including those used by 9,372 readers who consulted the library in person. The catalogue was increased by the addition of 8,091 cards. In accordance with the cooperative cataloguing arrangement 393 title entries were furnished to the Library of Congress for printing, the proof reading for which involved 76 galleys.

The books collated and prepared for the binder numbered 411. The letters and other papers translated from foreign languages for other divisions of the Survey numbered 149.

The bibliography of North American geology for 1917 was published as Bulletin 684. The bibliography for 1918 was completed and submitted in April for publication as Bulletin 698. The cumulated bibliography of North American geology has progressed so far that it will probably be ready for publication before the end of the fiscal year 1919–20.

It may be stated with confidence that the library contains practically all the important scientific and technical publications treating of the subjects included in the Survey's work, as well as the necessary guides, bibliographic aids, and reference books. By reason of its unusual resources it renders a unique service both to the scientific and technical force in Washington and, by correspondence, to investigators in all parts of the country.

REPORT OF THE DIRECTOR OF THE BUREAU OF MINES

The Bureau of Mines, in carrying out one of the provisions of its organic act—to disseminate information concerning investigations made—prints a limited free edition of each of its publications.

When this edition is exhausted, copies may be obtained at cost price only through the Superintendent of Documents, Government Printing Office, Washington, D. C.

The Superintendent of Documents *is not an official of the Bureau of Mines.* His is an entirely separate office and he should be addressed:

SUPERINTENDENT OF DOCUMENTS,
Government Printing Office,
Washington, D. C.

The general law under which publications are distributed prohibits the giving of more than one copy of a publication to one person. The price of this publication is 15 cents.

First edition. October, 1919.

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NINTH ANNUAL REPORT OF THE DIRECTOR OF THE BUREAU OF MINES.

By Van. H. Manning, Director.

INTRODUCTION.

On July 1, 1918, the Bureau of Mines was centering its efforts on war work, on doing what it could to aid the Government in bringing victory to the United States and the Allies. The suspension of hostilities on November 11 necessarily caused an abrupt change in many details of the work being done. The bureau was confronted with the need of enabling the mineral industries of the country to meet most effectively the inevitable difficulties that would confront them during the transition from the strain of war to the resumption of the normal activities of peace. Investigations in progress were stopped or given a new direction; plans for the future were changed; new investigations were proposed; work was concentrated on those investigations that promised to be most beneficial to the mineral industries during the period of transition and readjustment.

Established by Congress (37 Stat., 681) in 1910 for the purpose of conducting scientific and technologic investigations concerning mining and the preparation and utilization of mineral substances with a view to the increase of health, safety, and efficiency in the mineral industries, the bureau continued to study mine gases, rescue and first-aid training for miners, the utilization of coal with greater efficiency, the development of ways to utilize domestic minerals to replace minerals formerly imported, the prevention of waste in the production, transportation, and utilization of petroleum and natural gas, and the development of processes whereby deposits of minerals now unworked may become available as sources of supply. In addition the bureau conducted special investigations relating to new methods of producing various substances, administered the provisions of the law controlling the manufacture, sale, and use of explosives during the war, and gathered and disseminated information in regard to sources of supply of economic minerals throughout the world, the political control of these minerals, and the variations in demand at the principal markets, from month to month.

In the course of its work the Bureau of Mines cooperated with the Department of War, the Department of the Navy, the Department of Agriculture, the United States Fuel Administration, the War Industries Board, the Capital Issues Committee of the Treasury Department, the Council of National Defense, the War Trade Board, the Emergency Fleet Corporation, the United States Shipping Board, the Bureau of Standards, the National Research Council, and also with other bureaus of the Department of the Interior.

Some of the accomplishments of the year are briefly noted below. The purely war work of the bureau has been described in some detail in Bulletin 178.[a] War investigations coming within the scope of the present fiscal year are given brief mention in the present report.

SOME NOTEWORTHY RESULTS OF THE YEAR'S WORK.

In cooperation with the War and the Navy Departments continued work on plants for recovering helium, a rare gas needed for balloons and airships, from natural gas, and demonstrated the merits of the processes used.

Completed the construction, in cooperation with the War Department, of a plant for manufacturing sodium cyanide by the Bucher process.

In cooperation with the War Department developed a plant for the manufacture of nitric acid by the oxidation of ammonia.

Investigated mining and milling problems at mineral deposits throughout the country in order to ascertain the available supply of war minerals, and how these minerals could be produced more efficiently.

Issued reports showing the markets for various ores, minerals, and metals, and giving data on the status of various mineral industries.

Made a thorough study of the manufacture of sulphuric acid in the United States.

Completed a comprehensive review of the explosion tests of coal dust at the experimental mine near Bruceton, Pa.

Determined the value of the geophone, a device for detecting sounds transmitted through coal and rock, in recovery work, with especial reference to its use in locating mine fires and in communicating with miners entombed by a disaster.

Continued the study of the subsidence of the surface over coal mines in Illinois in order to ascertain what system of mining will

[a] Manning, Van. H., War work in the Bureau of Mines, 1919. Issued in four parts, as follows:

Bulletin 178–A. War gas investigations. pp. 1–38.
Bulletin 178–B. War minerals, Nitrogen fixation, and Sodium cyanide, pp. 39–61.
Bulletin 178–C. Petroleum investigations, and Production of helium, pp. 61–88.
Bulletin 178–D. Explosives and miscellaneous investigations, pp. 89–106.

do the least damage at the surface while permitting the largest recovery of coal.

Completed, in cooperation with the Bureau of Indian Affairs, the appraisal of the segregated coal and asphalt lands in eastern Oklahoma which belong to the Choctaw and Chickasaw Nations.

Investigated, in cooperation with the Public Health Service, dust and ventilation conditions in mines in Arizona.

Through field demonstrations showed operators and well drillers how large wastes of oil underground may be prevented by cementing oil wells so as to prevent water from entering the oil sands.

Gave the Bureau of Internal Revenue a method for estimating the future and ultimate production of oil fields, and thus determining depletion allowances in taxation.

Issued monthly reports on the operations of petroleum refineries throughout the United States, showing the output of the refineries and the amount of crude oil they used.

Studied methods of preventing losses of oil under ground through the infiltration of waters into oil sands.

Determined the advantage of the circulator method of drilling oil wells.

Cooperated with State officials of Wyoming in formulating a proposed law governing the drilling of wells in that State.

Investigated casing troubles and fishing methods in drilling oil and gas wells.

Cooperated with State officials of Illinois in remedying troubles from underground water in oil fields.

Determined the effects of various factors on the production of gasoline from heavy oils by the vapor-phase cracking process.

Made a nation-wide investigation of the grades of motor gasoline being marketed.

Demonstrated the value of absorption for recovering gasoline vapors in the residual gas from compression plants for obtaining gasoline from natural gas.

Gave further attention to the recovery of oil from the oil shales of Colorado and Utah.

Continued investigations of the fusing temperature of the ash of different coals in order to show the liability of the coals to clinker.

Ascertained the suitability of American graphites for various purposes.

Began a comprehensive investigation of the white clays of the United States and the value of these clays in the ceramic industry.

Began an investigation of the dolomite deposits of the Eastern States and the possibility of using calcined dolomite as a refractory material for lining furnaces.

Cooperated with the Geological Survey of Ohio in making a survey of the fire clays of that State.

In cooperation with the State of Idaho investigated the treatment of complex lead-zinc and copper-iron sulphide ores by flotation.

Investigated the fuel value of the lignite in the Nenana field, Alaska.

Continued investigations of the treatment of molybdenum ores.

As a result of the examination of methods of purifying crude graphite developed improvements in milling practice.

Studied the possibility of substituting domestic for imported graphite in the manufacture of crucibles.

Cooperated with the War Industries Board in measures to reserve an adequate supply of platinum for war requirements.

In administering the act regulating the manufacture, sale, possession, and use of explosives during the war; supervised the work of about 14,000 licensing agents throughout the United States and its insular possessions; investigated accidents at explosive plants; examined magazines for storing explosives; and began prosecutions against violators of the provisions of the act.

During the year trained 9,781 miners in first-aid and rescue methods at the mine safety cars and stations, as compared with 8,851 in the fiscal year 1918.

Investigated causes of 29 mine accidents, 19 in coal mines and 10 in metal mines.

Determined the limitations of Army gas masks for use at fires and in industrial plants.

Sampled coal mines for the Navy Department and prepared reports on the quality of coal and the methods of mining and preparing it for market.

Continued work on the explosibility of coal dust from different mines, thereby gaining additional information on how coal-mine explosions can be prevented or limited.

Developed a new method of signaling danger to miners underground by the injection of an ill-smelling substance into the compressed-air lines supplying mining machines and pumps.

Continued tests of explosives to determine their suitability for use in mines and quarries. Two new explosives were approved as permissible for use in dusty or gaseous coal mines. At the end of the year there were 162 explosives on the permissible list.

Made further tests of an explosive made of liquid oxygen mixed with carbonaceous material and investigated its suitability for mining work.

In cooperation with State mine inspectors, collected and published monthly reports on fatalities at coal mines throughout the country.

Improved furnaces in boilers of the Emergency Fleet, increasing the economy 16 per cent.

Acted in an advisory capacity for the United States Fuel Administration in matters of conservation.

Aided in extending the use of bituminous coal in water-gas manufacture.

Planned and had charge of the construction and operation of the Government fuel yards in the District of Columbia, from which all Federal and District Government institutions in or adjacent to the District are supplied.

Prepared for the War Department and Navy Department special steels containing uranium, tungsten, molybdenum and zirconium.

SOME URGENT NEEDS OF THE BUREAU.

The value to the mining industry of the bureau's work is forcefully indicated by the fact that the demands for investigations leading to greater safety and efficiency in the mineral industries constantly exceed the equipment and funds available for the purpose. On the other hand, the cost of supplies and equipment has greatly increased in recent times, so that even though rigid economies are practiced, it becomes increasingly difficult to maintain the service rendered to the mining industry in safeguarding the lives of the miners. The sum of $15,000 is urgently needed to cover the increased cost of supplies and equipment used in mine rescue and first-aid training and in other related work. In the investigation of safety devices for mines much work has already been done toward the determination of the best form of safety catches for hoisting equipment. To permit this work to be carried on adequately $1,800 is required in order to provide a junior mechanical engineer to assist in the making of laboratory tests of the various forms of safety catches.

On March 3, 1915, in response to urgent demands, Congress passed an act (49 Stat., 959) directing the Secretary of the Interior to establish and maintain in the important mining regions of the United States, seven mine safety stations in addition to those already established. The sum of $40,000 is urgently needed for the purchase and equipment of the seventh mine rescue car authorized in this act, and $25,583 will be required to cover the cost of operating the car during the fiscal year. Two of the mine rescue stations of the bureau are not yet provided with trucks, which are necessary to permit promptly dispatching to the scene of the disaster the necessary men and equipment for immediate succor. The sum of $15,000 is necessary to provide for purchasing, equipping, and providing necessary repairs for two such trucks.

The smoke nuisance in cities will probably be abated only when smokeless fuel is available at a cost not much exceeding that of soft

coal. Low-temperature distillation processes are being devised and tried for this purpose. The accumulated experience gained from the successes and failures of such attempts should be brought together for general use to expedite the obtaining of satisfactory processes. There are no standard methods of testing such processes and reports are not comparable. To provide engineers for keeping in touch with developments and making tests that will show the real value of different processes and will be comparable with each other, the sum of $9,000 is required for the fiscal year.

The processing of coal to produce a smokeless fuel will be adopted when the by-products have a value high enough to make the process pay. A study of the treatment of by-products is therefore necessary, and anything that can be done to simplify processes or enhance the value of products will expedite the production of smokeless fuels. Work should be done on the utilization of tar and on processes, such as electrical precipitation, for cleaning the gases without the use of water, so as to recover a superior grade of oil and tar in a cheaper and more direct way. This work would require the expenditure of $9,000 for the fiscal year.

To stimulate the use of local coals for city gas instead of hauling special coals long distances to be used for this purpose it is necessary to demonstrate that such coals can be used, to indicate the changes necessary to be made in gas-house equipment and practice, and to develop methods for cleaning the gas from high-sulphur coal. Considerable success has been attained in furthering the use of coals from the central fields in water gas sets instead of eastern coke. To continue this work on an adequate scale would require the expenditure of $7,000 for the fiscal year.

The experimental mine of the bureau at Bruceton, Pa., which has yielded results of great value in determining the conditions that lead to explosions in coal mines and how they may be controlled, is situated upon ground that is not owned by the Government, but is leased from private owners. In addition to the obvious desirability of the bureau owning the site on which it has placed valuable equipment, the Government should obtain complete control of this land in order to prevent the erection of dwellings thereon. It is, of course, unnecessary to enlarge on the undesirability of having dwellings erected in proximity to a place in which the producing of explosions, some of them of great force, is part of the regular work. This land can be purchased at a reasonable price, averaging about $225 per acre, and $18,000 is needed for this purpose.

The consumption of petroleum and its products is rapidly increasing, but the production of crude oil in the United States probably can not be increased, and underground reserves are already 40 per cent exhausted. It has been estimated that the waste in the ex-

ploitation of oil and gas in 1917 amounted to $2,000,000,000. Corrective measures can be applied; in the Cushing pool two Bureau of Mines men applied methods which increased production to a value of $3,000,000. Work to curtail such losses is actively in progress in Oklahoma, northern Texas, and Wyoming, and the sum of $25,000 is needed to permit the extension of this work to the Appalachian, Lima-Indiana, and Illinois oil fields.

The Pittsburgh mining experiment station, which was dedicated to the public service September 29, 1919, is because of its beauty and serviceableness a credit to the Nation. The building itself is completed, but as the site slopes steeply grading must be done, a concrete road constructed to connect the rear of the building to the street, and minor changes made in order that the surroundings shall be in keeping with the building itself. For this purpose $35,000 is required.

Larger printing funds are urgently needed by the bureau, which is specifically charged by law with disseminating information concerning mining and the preparation, treatment, and utilization of mineral substances with a view to improving health conditions and increasing safety, efficiency, economic development, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries. In consequence of the enlargement of the bureau's duties in response to the demand for its services and the increase in the scope and number of investigations it has been directed to make, there has been a steady increase in the number of reports submitted for publication. At the same time there has been a decrease in the amount that can be published because of the increased cost of printing at the Government Printing Office. In efforts to make its printing funds go as far as possible, the bureau has reduced the number of copies of reports printed for free distribution, although by so doing it has restricted such distribution of the results of its investigations as would make them of most use to the public. The editions of some publications have been exhausted within a few weeks of their issue. As the whole purpose of making the investigations authorized in the organic act creating the bureau is to render them available to the people of the Nation, it is obviously inefficient to waste the results of valuable investigations by not adequately providing for their dissemination. Thus an anomalous situation results; the bureau, although charged by law with taking steps to prevent inefficiency and waste, is itself open to criticism on this score. There is urgent need that a larger printing fund be provided to permit the results of investigations being printed promptly and distributed as freely as the needs of the mining industry require.

The amount allotted to the Bureau of Mines for the purchase of technical books and subscriptions to technical journals has never been increased, although the number of mining experiment stations and mine rescue stations has more than doubled. Technical books and journals are the tools of the scientific investigator and are even more essential to him than office equipment or laboratory facilities. How to provide the requisite technical books and technical journals has for years constituted a serious problem. Lack of sufficient funds is handicapping the bureau's research workers. More than one-half of the sum now available must be used for subscriptions to necessary technical journals, so that the amount remaining for the purchase of books is entirely inadequate. It is urgently necessary that the terms of the appropriation for mining experiment and mine-safety stations be so modified that subscriptions for necessary technical journals may be placed at the stations from the funds provided for the maintenance of the station.

The act of March 3, 1915, already mentioned, authorized the establishment and maintenance of 10 mining experiment stations in addition to those already established. Six of the 10 had been established before the United States became involved in the Great War. Now the remaining four stations thus authorized should be established at once, and funds should be appropriated for their establishment and maintenance.

In March, 1918, Congress made an appropriation of $150,000 for inquiries and scientific and technologic investigations concerning ores and mineral substances particularly needed in carrying on the war. This appropriation permitted the conduct, on an adequate scale, of work that previously had to be done in a small way because of lack of funds. In brief, this work largely consisted of supplying promptly to Congress and to other authorized agencies of the Government full and complete information regarding the occurrence, exploitation, preparation, and use of all the multitudinous varieties of mineral and metallic substances in order that these agencies may be able to take such action as will be most beneficial to the public. The present personnel of the bureau is engaged in specific investigations and the preparation of such reports involves an investigator being diverted from his regular work, often for considerable periods of time, and frequently requires bringing men to Washington from long distances in the field. This service is necessary; the need for it has existed and continues to exist. In the emergency of war this need became so acute that it had to be met. The problems of reconstruction are no less important than those of war and it is urgently necessary that an appropriation of $150,000 a year be provided in order that the information mentioned may be made available for the President, the Congress, and all departments and agencies of the Government.

COOPERATIVE AGREEMENTS.

In its endeavor to secure the most effective action with State agencies seeking the improvement of efficiency and the lessening of accidents in the mineral industries, the Bureau of Mines, with the approval of the Secretary of the Interior, has made cooperative agreements with State organizations and with State universities and mining schools.

In the past fiscal year investigations as outlined were conducted under the terms of cooperative agreements with the universities, mining schools, and State organizations named below:

University of Arizona, Tucson, Ariz.—Improvement of conditions in the mining, quarrying, metallurgical, and miscellaneous mineral industries, with special reference to the treatment of low-grade copper ores.

Industrial Accident Commission of California.—Improvement of conditions in mining, quarrying, metallurgical, and other mineral industries, safeguarding life among employees, and preventing unnecessary waste of resources.

University of California, Berkeley, Calif.—Improvement of conditions in mining, quarrying, metallurgical, and other mineral industries, with special reference to quicksilver and the precious metals.

University of Idaho, Moscow, Idaho.—Investigations aimed at the improving of conditions in the mining, quarrying, metallurgical and other mineral industries, with special reference to the losses that take place in the mining and milling of lead and zinc ores; safeguarding life among employees and preventing unnecessary waste of resources.

Colorado School of Mines, Golden, Colo.—Recovery of values from rare metals and from low-grade and complex ores.

Engineering experiment station of the University of Illinois, Urbana, Ill., and Illinois Geological Survey.—Study of coal-mining methods, means of promoting the safety of coal miners, and methods of utilizing coal.

University of Minnesota, Minneapolis, Minn.—Improving conditions in the mining, quarrying, metallurgical, and other mineral industries, especially in connection with the mining and concentration of iron and manganese ores, safeguarding life among employees, and preventing unnecessary waste of resources.

Ohio State University, Columbus, Ohio.—Increased efficiency in the utilization of mineral substances necessary to the ceramic industry, stimulating and upbuilding this industry and substituting ceramic products of American manufacture for those now imported.

Oregon Bureau of Mines and Geology.—Improvement of conditions in the mining, quarrying, metallurgical and other mineral in-

dustries, safeguarding life among employees and preventing unnecessary waste of resources.

Industrial Commission of the State of Utah.—Methods of mining that relate to health, sanitation, and safety conditions, and the appliances best adapted to prevent accidents in mines, mills and smelters; the improvement of conditions affecting health and safety in mining, milling and smelting; improvements in the use of explosives and electricity in such operations; inquiries and investigations relating to health, sanitation, and safety in the mining and metallurgical industries, and the obtaining of prompt and reliable reports of personnel accidents in such industries.

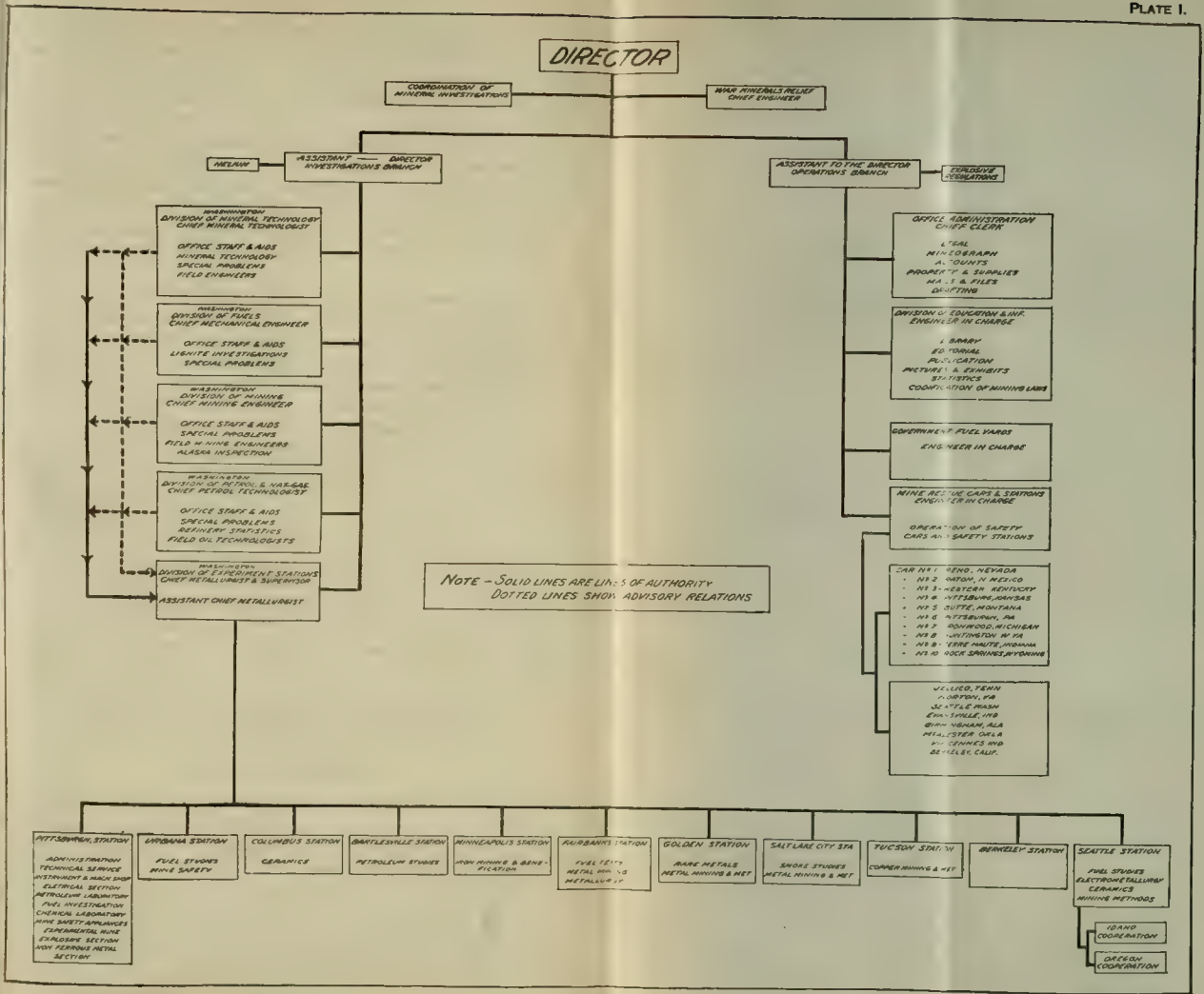
State School of Mines of the University of Utah, Salt Lake City, Utah.—Recovery of valuable minerals from low-grade and complex ores, the prevention of waste and the increase of efficiency in the preparation, treatment and utilization of mineral substances.

University of Washington, Seattle, Wash.—Improvement of condition in the mining, quarrying, metallurgical and other mineral industries, with special reference to mining and preparation of coals, dressing low-grade ores, and electrometallurgy; safeguarding life among employees and preventing unnecessary waste of resources.

ORGANIZATION.

As a result of the signing of the armistice and the immediate cessation of hostilities by American forces, work on various investigations was suspended, and various members of the bureau, feeling that their country no longer needed their services, resigned. The administrative divisions, each in charge of a division chief who reported to the director, continued during the year, the work of explosives regulation and the investigations relating to war minerals being grouped in separate divisions.

The strictly administrative work at the bureau headquarters in Washington, D. C., continued under the immediate supervision of the director, Van. H. Manning. H. Foster Bain was assistant director until his resignation June 11, 1919. D. A. Lyon acted as supervisor of mining experiment stations. The local administration of the Pittsburgh mining experiment station was intrusted to O. P. Hood, chief mechanical engineer, until August 16, 1918, when it was intrusted to D. A. Lyon. L. H. Duschak, chemical engineer, acted as administrative head of the station at Berkeley, Calif.; R. B. Moore, physical chemist, acted in a similar capacity for the station at Golden, Colo.; Edmund Newton, mining engineer and metallurgist, was in charge of the Minneapolis station up to September, 1918, when he was succeeded by C. E. Julihn; J. O. Lewis, petroleum engineer, was superintendent of the Bartlesville,



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Okla., station until January 22, when he became chief petroleum technologist, and was succeeded at Bartlesville by W. P. Dykema. Thomas Varley, metallurgist, was in charge of the station at Salt Lake City, Utah; F. K. Ovitz, ore-dressing engineer, was in charge of the station at Seattle, Wash., and C. E. van Barneveld was supervising engineer and metallurgist of the station at Tucson, Ariz. E. A. Holbrook, mining engineer, was in charge of the station at Urbana, Ill.; R. T. Stull, chief ceramist, was superintendent of the ceramics station at Columbus, Ohio; J. A. Davis, mining engineer, was in charge of the Alaska station at Fairbanks, and C. P. Bowie, petroleum engineer, was in charge of the office in San Francisco, Calif.

F. J. Bailey, chief clerk, had charge of routine administrative matters at the Washington office. J. W. Thompson and P. S. Black, law examiners; and A. H. Fay, mining engineer, charged with the collection of mine-accident statistics, were also stationed in Washington.

The general supervision of the bureau's library and the conduct of affairs with respect to publications, personnel, mails and files, supplies, and accounting were centered at the Washington office.

In addition to his other duties, the director has general supervision of the work of the Federal mine inspector for Alaska, and the inspection of coal mines on Indian or Government lands in Oklahoma and Wyoming.

By reason of the many changes in personnel, the magnitude of the war work that had been done, and the need of reorganizing the bureau's activities so as to coordinate the work of the experiment stations, the advisability of a general reorganization of the bureau became evident by the end of the fiscal year. The general plan of organization adopted after thorough discussion and with the approval of the Secretary of the Interior is shown by the accompanying diagram, Plate I.

The divisions that did investigative work during the fiscal year 1919 and the chief investigations undertaken are named below.

MINING DIVISION.

George S. Rice, chief mining engineer, stationed at Washington, had charge of the mining division.

J. W. Paul, chief coal-mining engineer, had charge of all field investigations and all work at the experimental mine pertaining to coal mining. The mining engineers in charge of the several field districts are named on pages 686 to 689.

D. J. Parker, mine-safety engineer, stationed at Pittsburgh, had charge of mine-rescue operations, the testing of mine-rescue apparatus, the training of miners in first-aid and rescue methods, and the conduct of rescue and first-aid contests.

Sumner S. Smith, mining engineer, served as Federal mine inspector for the Territory of Alaska, with headquarters at Juneau, Alaska.

Special investigations undertaken by the mining division and the names of the officials in charge are outlined below:

Special investigation of mining conditions in the devastated areas of France and Belgium, Mr. Rice.

Tests of methods of preventing explosions and various tests of mine equipment, conducted at the experimental mine near Bruceton, Pa., and in the field, W. L. Egy, physicist.

Physical tests of mine explosives, S. P. Howell, explosives engineer.

Chemical tests of mine explosives, E. J. Hoffman, assistant, and A. C. Fieldner, chemist.

Uses of the geophone in mining work, Alan Leighton, physicist.

Use of permissible explosives and inspection of coal mines on Indian lands in Oklahoma, J. J. Rutledge, mining engineer.

Investigation of recovery of "coal brasses," Mr. Rice, Mr. Holbrook, Mr. Paul, and others.

Causes and prevention of subsidence from coal mining in certain districts in Illinois, Mr. Rice.

Investigations of coal-mine gases, in cooperation with the State of Illinois, E. A. Holbrook, mining engineer.

Special investigations of metalliferous deposits, R. R. Hornor.

FUELS AND MECHANICAL-EQUIPMENT DIVISION.

The fuels and mechanical-equipment division was under the supervision of O. P. Hood, chief mechanical engineer, who was stationed in Pittsburgh until July, 1918, when his office was moved to Washington.

The investigations undertaken or continued during the year and the officials in charge were as follows:

General fuel investigation, Mr. Hood.

Inspection of Government fuel purchases, G. S. Pope, engineer, and H. M. Cooper, chemist.

Fuel efficiency, Henry Kreisinger, engineer.

Electrical equipment in mines, F. C. Ilsley, electrical engineer.

Mine equipment and investigation of coal-mine hoisting accidents, Mr. Hood and R. H. Kudlich, mechanical engineer.

Tests of safety lamps, Mr. Ilsley.

Utilization of lignite, Mr. Hood and S. M. Darling, fuel engineer.

Analysis of coal purchased for the Government, Mr. Cooper.

Tests of Illinois coal in coke evens, Mr. Hood, F. K. Ovitz, and W. A. Selvig.

Boiler tests for the Emergency Fleet Corporation, W. R. Argyle, assistant physicist.

Use of powdered coal, A. R. Mumford, assistant engineer.

Use of fuel for distilling oil, Mr. Argyle.

Tests of coke for house-heating purposes, C. E. Augustine, assistant engineer, and Alfred Iddles, fuel ingineer.

Heat transmission into steam boilers, F. C. Houghton, assistant physicist.

Combustion tests of coal, Mr. Augustine.

DIVISION OF MINERAL TECHNOLOGY.

C. L. Parsons, as chief chemist and chief mineral technologist, had charge of the division of mineral technology during the year, with headquarters at Washington.

Although the division remained one of the administrative units of the Bureau of Mines, its activities were wholly given to problems related to war work, and all the personnel of the division except that of the laboratory at Ithaca, N. Y., was transferred to the war minerals investigations. A summary of the work of the Ithaca office is given on pages 763 and 764.

As chief chemist, Dr. Parsons had supervision of the chemical-research laboratory of the bureau, this laboratory being at the Pittsburgh station. A summary of the work of this laboratory appears on pages 744 to 751. He also supervised the chemical research work at the Columbus station and the Golden station.

METALLURGICAL DIVISION.

The metallurgical division was in charge of F. G. Cottrell, chief metallurgist, with headquarters in Washington.

In the spring of 1919 Dr. Cottrell went to Europe as a member of a commission charged with investigating metallurgical industries in Europe with regard to changes brought about by the war. He was absent until the end of the fiscal year.

During the first half of the year the majority of those engineers and chemists handling metallurgical problems for the bureau were giving their time to the study of special questions relating to the war. Hence the work done during the year may be divided into two classes, (1) war work, and (2) investigations having for their object the development of processes for the prevention of waste. Some special problems of the division were as follows:

Smelter fumes, including recovery and utilization of sulphur and other substances, A. E. Wells, metallurgist, under the direct supervision of the chief metallurgist.

Treatment of low-grade and complex ores, especially lead and zinc ores in the State of Utah, in cooperation with University of Utah, Thomas Varley, metallurgist, and F. G. Moses, hydrometallurgist.

Hydrometallurgy of gold and silver ores, G. H. Clevenger, metallurgist.

Mining and milling methods for lead and zinc ores, C. A. Wright, metallurgical engineer.

Investigation of the flotation process, W. H. Coghill, metallurgist.

Prevention of waste in the recovery of quicksilver from its ores, L. H. Duschak, chemical engineer.

Treatment of low-grade and complex copper ores, C. E. van Barneveld, supervising mining engineer and metallurgist.

Concentrating processes for the treatment of low-grade and complex ores, with special reference to the treatment of war minerals, such as the ores of chromium, manganese, and nickel, Mr. Varley.

Recovery of potash and valuable metals from mill tailing, Mr. Clevenger.

Investigation of blast-furnace slags, P. H. Royster, assistant physicist.

Beneficiation of low-grade manganese ores with special reference to the substitution of domestic for imported ores in the production of ferromanganese, silicomanganese, etc., Mr. Royster.

Special investigation of problems connected with the production of metals from Alaskan ores, J. A. Davis, mining engineer.

Cooperative work with the Netherlands Government on the Caron process for the recovery of precious metals from ores high in manganese, having for its object the saving of both the manganese and the precious metals, Mr. Clevenger.

The recovery of "coal brasses" (streaks and nodules of "sulphur") as a by-product in the washing of coal, E. A. Holbrook, mining and metallurgical engineer.

DIVISION OF PETROLEUM TECHNOLOGY.

Chester Naramore remained in charge of the division of petroleum technology, with headquarters in Washington, until February 1, 1919, when he resigned from the Government service and was succeeded by J. O. Lewis.

Some of the special investigations of the year were as follows:

Problems relating to the handling of petroleum and its products in allied countries, Mr. Naramore and W. E. Perdew, chemical engineer.

Protection of oil fields against water, F. B. Tough, petroleum technologist.

Circulator method of drilling wells, Mr. Tough.

Oil-field water problems and methods of correction, A. W. Ambrose, petroleum technologist.

Use of screen pipe and perforated casing in oil wells, E. W. Wagy, petroleum engineer.

Cooperative work with the United States Land Office in the study of physical conditions of leased lands in the California fields, Mr. Wagy.

The modes of occurrence of gas, oil, and water in different fields, and the factors and relationships controlling these modes of occurrence, R. V. Mills, petroleum technologist.

Methods of cementing off water in wells, Mr. Mills.

Refinery statistics, H. F. Mason, petroleum economist.

Cooperative work with the office of Indian Affairs in Oklahoma, V. L. Conaghan, chief oil and gas inspector, and A. A. Hammer, oil and gas inspector.

Oil-camp sanitation, C. P. Bowie, petroleum engineer.

Drilling problems in Oklahoma, T. E. Swigart, assistant technologist in oil and gas production.

Methods of topping petroleum, J. M. Wadsworth, petroleum engineer.

Economy in the use of fuel oil, Mr. Wadsworth.

Occurrence of helium in natural gas, Mr. Lewis, Mr. Ambrose, and Mr. Wagy.

Methods of estimating the future production of oil properties, C. H. Beal, petroleum technologist.

Depreciation of equipment used in producing, handling, and marketing petroleum and natural gas, Messrs. Ambrose, Hill, and J. P. Smootz.

Methods of combating invading waters in El Dorado-Augusta fields, Kansas, M. A. La Velle and Thomas Curtin, expert drillers, and Mr. Lewis.

Casing problems and fishing methods, Mr. Curtin.

Evaporation losses of oil in storage, Mr. Bowie, A. R. Elliott, assistant engineer, and J. H. Wiggin, assistant engineer.

Transportation and utilization of heavy oil, Mr. Bowie and M. J. Gavin, assistant refinery engineer.

Increase of efficiency in the manufacture of carbon black, R. O. Neal, chemical engineer, and G. St. J. Perrott, physical chemist.

Absorption of gasoline from the residual gas of compression plants, W. P. Dykema, petroleum engineer, and R. O. Neal.

Specifications for petroleum products, Mr. Beal and H. H. Hill, petroleum chemist.

Inspection of overseas shipments of gasoline, C. R. Bopp, junior research chemist.

Cooperative work with the United States Fuel Administration, Messrs. Bowie, Dykema, Wagy, Wadsworth, Perdew, Beal, Ambrose, and H. P. Pierce.

Study of fuel for aeroplane engines, E. W. Dean, petroleum chemist; Mr. Perdew, Mr. Hill, Clarence Netzen, chemical engineer.

Investigation of oil shales, Mr. Perdew; D. T. Day, consulting chemist; W. D. Bonner, consulting chemist; Mr. Gavin; Mr. Hill; E. L. Quinn, T. B. Brighton, assistant chemists.

Study of lubricants for aeroplanes and motor trucks, Mr. Dean and Mr. Hill.

Character of commercial gasolines, Mr. Dean and others.

Fuels for supercompression motors of aircraft, Mr. Netzen and J. P. Smootz, assistant petroleum chemist.

Analytical distillation of emulsified and high-boiling oils, Mr. Dean, Mr. Hill, and N. A. C. Smith, assistant petroleum chemist.

Analyses and tests of oils and products for Bureau of Mines, Panama Canal, Post Office Department, Signal Corps, Quartermaster Corps, Bureau of Standards, Messrs. Perdew, Gavin, Dean, and Bopp.

Production of gasoline from heavier oils by vapor-phase cracking, Mr. Dean and W. A. Jacobs, assistant chemical engineer.

Bibliography of the petroleum industry, Miss E. H. Burroughs, editorial assistant.

WAR-MINERALS INVESTIGATIONS.

J. E. Spurr, as executive, had charge of the war-minerals investigations, his headquarters being at the Washington office. A. G. White acted as administrative assistant. The Washington staff of engineers, chemists, and metallurgists, in charge of investigations relating to the production of different minerals and metals, is named below:

Oliver Bowles, aluminum and bauxite, asbestos, asphalt, barytes, cement, corundum, emery, fluorspar, lime, lithia minerals, lithium, mica, mineral paints, pumice, stone, strontium; W. R. Crane, chromium, manganese; R. R. Hornor, cadmium, pyrite, sulphur, tin; F. B. Hyder, antimony, bismuth, graphite, lead, quicksilver, zinc; R. B. Ladoo, chalk, clays, fuller's earth, gypsum, talc; H. C. Morris, molybdenum, monazite, nickel, titanium, tungsten, uranium, vanadium, zirconium; R. B. Moore, radium; J. C. Pickering, copper, gold, platinum, iridium, osmium, silver; W. C. Phalen, salines (including borax), magnesite, phosphates; A. E. Wells, arsenic, potash, sulphuric acid; C. M. Weld, iron. H. S. Mudd had special charge of general informational and contact work.

Various problems relating to these minerals were assigned as follows: Mining methods, R. R. Hornor; labor, legislation, problems of mining and shipping and excess-profits tax, A. G. White; mining costs and ore markets, J. C. Pickering; foreign ore deposits, foreign trade conditions, political and commercial control of minerals, J. E. Orchard.

When the armistice was signed the personnel of the war minerals investigations included some 90 mining engineers, metallurgists, and chemists. Of these about two-thirds were engaged in the staff and field work of the longer investigations, the rest were consulting engineers working on special problems.

As Congress failed to appropriate funds for continuing, during the fiscal year 1920, mineral investigations similar to those that had been made during the fiscal year 1919, the war minerals investigations, as such, ended June 30, and most of the engineers and metallurgists left the Government service.

EXPLOSIVES DIVISION.

The explosives division has been in charge of Clarence Hall as administrative head and chief explosives engineer since July 18, 1918. Before then F. S. Peabody was in charge, as assistant to the director in charge of explosives. D. D. Bush, who had been assistant administrative head, under Mr. Peabody, continued in that capacity until January 7, 1918, when he was succeeded by D. S. Boynton, who served until January 16, 1919. Edgar Priest, who has been acting as special investigator for this division as well as other branches of the Bureau of Mines, succeeded Mr. Boynton. W. S. Topping, of the Bureau of Explosives, New York City; Dr. Charles E. Munroe, chief explosives chemist; G. N. Snow, explosives inspector; and H. D. Trounce, explosives engineer, aided in the investigation of fires and explosions caused by explosives, and the criminal use of explosives; including the "May-Day bombs" that were sent through the mails and the bomb that wrecked the home of Attorney General Palmer. A. C. Yznaga assisted in the conduct of routine administrative matters in the Washington office.

The field force comprised 49 explosives inspectors, and approximately 14,000 licensing agents throughout the country. The inspectors were appointed by the President and the licensing agents by the Bureau of Mines. Inspections and recommendations were made for improved and safer construction of approximately 7,000 powder magazines. During the year the War Department turned over to the Department of the Interior more than 25,000,000 pounds of T N T and other explosives, to be used on construction work by different branches of the departments. The Secretary of the Interior delegated to the Director of Mines supervision of the apportion-

ment of these explosives. This work is being conducted through the explosives division. Licensing of users of platinum and allied metals to limit during the war the possession and use of these metals was conducted through the explosives division.

SPECIAL INVESTIGATIONS.

HELIUM INVESTIGATIONS.

The Bureau of Mines took the leading part in developing the recovery on a commercial scale of helium, a rare gas peculiarly suitable for use in balloons and airships, from natural gas. During the fiscal year 1918, with the aid of the Army and Navy Departments, a large amount of work was done in examining gas fields for helium and in erecting and operating three experimental plants for the recovery of helium from the gas of the Petrolia field which supplies Fort Worth, Tex. This work has been described in Bulletin 178–C.[a] Construction of one of these plants known as the Bureau of Mines or Norton process plant and later designated Plant No. 3, was completed on or about October 1, 1918, on the basis of a maximum production of 30,000 cubic feet of helium a day. Dr. R. B. Moore, physical chemist, represented the Bureau of Mines at the plant.

Construction of all three helium plants was carried out by the Constructing Quartermaster Corps of the Army, cooperating with the Bureau of Mines; the finances of the helium undertaking have been handled by the finance division of the Bureau of Aircraft Production (now Air Service of the Army) and the accounting section of the Bureau of Mines.

Of the three plants, Plant No. 1 (Linde process) began producing helium April 8, 1918; and Plant No. 2 (Claude process), May 1, 1918. About 150,000 cubic feet of the gas, stored in steel cylinders, was on the dock at New Orleans awaiting shipment to France when the armistice ended hostilities.

In order to coordinate the different agencies concerned in the helium project, and to take steps for controlling effectively the exploration and conservation of helium, a committee consisting of one representative from each of the three governmental departments chiefly concerned was appointed by resolution of the Aircraft Board on August 23, 1918. G. O. Carter, chairman, represented the Navy; Dr. Harvey N. Davis, the Army; and George A. Orrok, the Department of the Interior.

In August, 1918, the War and Navy Departments, realizing the paramount importance of insuring a supply of helium for military purposes, determined to build a large production plant (Linde

[a] Manning, Van. H., Production of helium; petroleum investigations: Bull. 178–C, Bureau of Mines, 1919.

process) at Fort Worth, and arranged for a lease of the Petrolia gas pool and for a Government pipe line to convey gas from Petrolia to the plant.

On December 8, 1918, the Aircraft Board in a report to the Secretary of War and the Secretary of the Navy made recommendations for the future, suggesting four plans, one of which it preferred. On December 17 the Director of the Bureau of Mines submitted to the Secretary of the Navy and the Secretary of War, a plan that provided for further operation of all three experimental plants, also for a new Claude unit, and included a fund for conserving the helium supply of the Nation.

On December 27, 1918, the Secretary of the Navy wrote to the Director of the Bureau of Mines disapproving further experimental work by the Government in connection with Plants 1 and 2, consenting to a limited further experimental operation of Plant No. 3, and advising him of the adoption of the plan preferred by the Aircraft Board. On January 9, 1919, Maj. Gen. Jervey, of the General Staff of the Army, wrote advising that the War Department concurred in the action of the Secretary of the Navy and that the accomplishment of the plan would be intrusted to the Navy Department.

Accordingly, the Director of the Bureau of Mines ordered Plants 1 and 2 shut down on January 23. The Bureau of Yards and Docks of the Navy Department took physical possession of Plant No. 2 and of the Government property of Plant No. 1, as of April 1, 1919. All helium produced at these plants was placed in the custody of the Navy Department at its special request.

After overcoming many obstacles that could not be foreseen, Plant No. 3 on April 2, 1919, began to produce helium, but steady production could not be maintained because of the need of making repairs, and because of difficulty in obtaining a supply of natural gas of uniform quality. On the recommendation of the Director of the Bureau of Mines, April 16, 1919, an allotment of $100,000 for needed alterations and additional equipment for Plant No. 3 was requested, one-half by the Army and one-half by the Navy, and later was made available. During the remainder of the year the work of designing and procuring this equipment and continuing experimental plant operation was carried out.

PRODUCTION OF SODIUM CYANIDE.

At the beginning of the year work was in progress on a plant at Saltville, Va., for the manufacture of sodium cyanide by the Bucher process.

In the construction of this plant the Quartermaster General's Office and the Ordnance Department of the Army cooperated with the

Bureau of Mines, the Army providing the funds and the bureau the plans and the technical control. C. L. Parsons, chief chemist of the bureau, was in charge of the work. The plant, which cost $2,500,000, was ready for operation early in November and was running at the time of the armistice. On December 21, 1918, the control of the plant and its personnel passed from the Bureau of Mines to the War Department.

OXIDATION OF AMMONIA TO NITRIC ACID.

During the year the War Department erected at Sheffield, Ala., in connection with the synthetic ammonia plant, a plant for the manufacture of nitric acid by the oxidation of ammonia. The apparatus in this plant, which is more efficient than any hitherto devised, was the result of extensive experimentation under the direction of Dr. Charles L. Parsons, of the Bureau of Mines, with the cooperation of the Ordnance Department and the Semet Solvay Co., at Syracuse, N. Y.

Dr. Parsons, chief chemist of the bureau, accompanied by Mr. Eysten Berg, an engineer familiar with nitrogen-fixation practice in Norway, late in 1917 made a trip to Europe as the representative of the War Department, to study the nitrate plants in France, Italy, England, Norway, and Sweden. The information obtained was incorporated in a report by Dr. Parsons, which was subsequently used as a basis of the report of the committee on nitrate supply, rendered May 11, 1917, to the Secretary of War.

As the result of experimentation at Syracuse, N. Y., conducted under the direction of Dr. Parsons, of the bureau, and Dr. L. C. Jones, chief chemist of the Semet Solvay Co., assisted by J. D. Davis, chemist of the bureau, Capt. G. A. Perley, and other chemists of the Ordnance Department, and chemists of the company, a type of apparatus was evolved that gave highly satisfactory results in semicommercial tests at Syracuse. This apparatus was adopted for Chemical Plant No. 1, at Sheffield, Ala.

WAR MINERALS RELIEF COMMISSION.

An amendment to the minerals-control act of October 5, 1918, authorizing the Secretary of the Interior to examine claims and pay off financial losses of the producers of certain minerals, where it could be shown that the production had taken place as a result of Government action, was attached to the Dent military bill (Public, No. 322), which was signed by the President on March 3, 1919. The measure authorized investigation of net losses incurred by producers of manganese, chrome, pyrite, and tungsten, and the maximum amount to be expended under the measure was limited to $8,500,000.

A commission of three members, known as the War Minerals Relief Commission, is now reviewing the claims and making the awards. The members of the commission are J. F. Shafroth, M. D. Foster,[a] and P. N. Moore. The Secretary of the Interior authorized the Director of the Bureau of Mines to conduct the field engineering and accounting investigations, also the office routine and administrative work of the commission.

As soon as it was organized, the commission prepared and sent out questionnaires to all claimants for relief under the terms of the act, had examinations made by the engineers, and at the end of the fiscal year it was holding hearings in the West.

ECONOMIC LIAISON COMMITTEE.

Late in March, 1919, an interdepartmental committee known as the Economic Liaison Committee was organized under the chairmanship of Wesley Frost, assistant acting foreign-trade adviser of the State Department, to expedite the handling of matters of interdepartmental consultation, and to harmonize and integrate work of the various governmental agencies in Washington in economic matters connected with foreign trade.

This committee meets once a week and reports through subcommittees on such questions as the supply and distribution of raw materials, finance, and transportation.

The representatives of the mineral industry on the committee are H. C. Morris, Bureau of Mines, and E. S. Bastin, United States Geological Survey. These representatives serve as permanent contact officers of the two bureaus by direct authority of the Secretary of the Interior, and are ex officio members of all subcommittees considering subjects in which the two bureaus are concerned. They are privileged to call in to the deliberations of the subcommittees those specialists of the bureau most familiar with the subject under consideration and various members of the bureau and the survey have participated in the preparation of reports.

Reports on a wide variety of subjects have been prepared and are in course of preparation for submission to the various departments represented for their use, and for such publicity as the confidential nature of the reports will permit.

Of particular interest to the mineral industry are the reports on coal, potash, and petroleum. The coal report deals largely with the new position in export trade which confronts the United States by reason of the grave shortage in those countries ordinarily supplying foreign requirements. The report on potash was prepared under the chairmanship of H. C. Morris, of the Bureau of Mines, and on

[a] Dr. Foster died Oct. 20, 1919. He was stricken with illness while touring the west with the commission.

the subcommittee that prepared the petroleum report were J. O. Lewis, chief petroleum technologist, W. E. Perdew, petroleum chemist, and A. G. White, mine economist of the bureau. All phases of the petroleum situation, including resources, production, and foreign trade, with particular reference to the increased activities of foreign governments in acquiring petroleum concessions were incorporated in the report.

POLITICAL AND COMMERCIAL CONTROL OF MINERALS.

In May, 1918, the Bureau of Mines, the United States Geological Survey, and other Government bureaus were invited to contribute to a series of reports on the political and commercial control of the mineral resources of the world initiated by J. E. Spurr, then a member of the committee on mineral imports of the United States Shipping Board. J. E. Orchard, assistant mine economist of the Bureau of Mines, was placed in charge of the editing and publication of the reports. These reports, issued in mimeographed form, were confidential and they were supplied to Government officials only. They were used by the economic advisers of the American delegation at the peace conference. In all 32 reports were issued. The list follows:

Foreword	J. E. Spurr.
Aluminum and bauxite	J. H. Hill.
Asbestos	Oliver Bowles.
Antimony	H. G. Ferguson and D. A. Hall.
Chromite	E. C. Harder.
Coal	G. S. Rice and F. F. Grout.
Copper	F. W. Paine.
Emery and corundum	F. J. Katz.
Gold	J. E. Orchard.
Graphite	H. G. Ferguson and F. F. Grout.
Iron	E. C. Harder and F. T. Eddingfield.
Lead	F. B. Hyder.
Magnesite	R. W. Stone.
Manganese	D. F. Hewett.
Mercury	F. L. Ransome.
Mica	D. A. Hall.
Molybdenum	R. B. Moore.
Monazite	R. B. Moore.
Nickel	C. S. Corbett.
Nitrogen	C. G. Gilbert.
Petroleum	J. D. Northrop.
Phosphate rock	R. W. Stone.
Platinum	J. H. Hill.
Potash	A. W. Stockett.
Radium	R. A. F. Penrose, jr.
Silver	F. W. Paine.
Tin	Howland Bancroft.
Tungsten	F. L. Hess.
Uranium	R. B. Moore.
Vanadium	R. B. Moore.
Zinc	M. F. Chase and F. B. Hyder.
Zirconium	H. C. Morris.
Mexico	J. E. Orchard.

STATISTICS OF ACCIDENTS AND FATALITIES IN THE MINERAL INDUSTRIES.

With the purpose of providing reliable information as to the hazards of workmen in the mineral industries and the work to be done in lessening the death rate from accidents, the Bureau of Mines compiles and publishes reports on mine fatalities. Information as to fatalities in coal mines is collected through the cooperation of State mine inspectors.

Data on accidents in metal mines, quarries, and metallurgical plants, except blast-furnace plants, are furnished voluntarily by operators, there being no Federal law requiring the operators to report. Although these figures are not absolutely complete, they are on a comparable basis for calendar years and furnish means for an intelligent comparison of statistics of accidents in the different States.

The reports on coal-mine fatalities are issued monthly; those on metal mine, quarry, and coke-oven accidents and on accidents at metallurgical plants are issued annually. The collection and compilation of these statistics are in charge of A. H. Fay, mining engineer.

GLOSSARY OF THE MINERAL INDUSTRY.

A glossary of terms used in the mineral industry is now in press. This glossary defines more than 20,000 terms related to mines, quarries, oil and gas wells, reduction works, mineralogy and geology, including provincialisms and terms now obsolete. This work is in charge of Mr. Fay.

EXAMINATION OF MINING LAWS.

In order to promote uniformity in the mining laws of the several States, the Bureau of Mines is collecting and publishing the State laws and the court decisions showing how the laws have been interpreted. This work is essential in showing the growth of the mining laws and what provisions the courts have held to be valid and invalid, and constitutional and unconstitutional.

During the year the bulletins for the California and the Illinois statutes were published, and the bulletin for the Pennsylvania statutes is in press. The manuscript of the bulletin for the Colorado statutes is practically ready for the printer.

The law examiner, J. W. Thompson, who is in charge of this work at the Washington office, has continued to complete abstracts of the current decisions of the United States and State courts in all cases

relating to mining, and these abstracts are published regularly every four months as serial bulletins. Special effort is made to include every decided case relating to mining and so to state the point decided that laymen may readily comprehend the propositions laid down. During the year three volumes of these abstracts were published as Bulletins 152, 159, 164.

INVESTIGATION OF THE GOLD-MINING SITUATION.

In July, 1918, the Secretary of the Interior, because of the rapidly increasing cost of producing gold and the declining output of that metal in the United States, appointed a committee composed of members of the Bureau of Mines and members of the United States Geological Survey to study the gold-mining situation in this country. Hennen Jennings, chairman, J. H. Mackenzie, and Charles Janin represented the Bureau of Mines, and H. D. McCaskey and F. L. Ransome, the Geological Survey.

The report of the committee, setting forth its findings and conclusions, with proposed measures for the relief of the industry, was rendered in final form October 30, 1918, and later was published by the Bureau of Mines as Bulletin 144.

WORK OF THE SEVERAL DIVISIONS.

MINING DIVISION.

The administration of the mining division during the fiscal year was carried on through four subdivisions or sections: (1) Safety and rescue work, under the charge of D. J. Parker, mine safety engineer, aided by E. H. Denny, assistant mine safety engineer; (2) explosives testing, in charge of S. P. Howell, explosives engineer; (3) coal-mine investigations, under the charge of J. W. Paul, coal-mining engineer, the headquarters of these three sections being at the Pittsburgh station; and (4) various investigations under the direct charge of the chief mining engineer. Much of the work of the mining division is described under the chapter on the Pittsburgh station, pages 90 to 100.

WORK OF THE CHIEF MINING ENGINEER.

Apart from his administrative duties as chief of the division, George S. Rice, in compliance with a request from the Shipping Board, was occupied the first part of the fiscal year in gathering data and in preparing a report on the control of coal after the war.

Mr. Rice also prepared reports on the Stone Canyon coal mine in California, for the United States Fuel Administration; reviewed data gathered by F. T. Eddingfield, mining engineer, and J. R. Finlay, consulting mining engineer, in the Minnesota iron district and determined the scope of the technical work to be covered in Mr. Finlay's report on the leasing system for State-owned iron lands in Minnesota; planned investigations on the use of geophones in military mining, and in ordinary mining operations, with W. L. Egy, physicist, and Alan Leighton, assistant physicist; visited experimental stations and points where field investigations were in progress, and held conferences with the French High Commission and others regarding the destruction and restoration of coal mines in France.

On February 20 Mr. Rice left for Europe to gather scientific and technical data on the mining methods employed during the war in European countries and to observe the extent of the destruction in the French coal mines in the Nord and Pas-de-Calais Basins and the methods taken for restoring the mines; also, the methods of mining in the Briey iron district. He visited mines in the north, center, and south of France; made a trip through the Belgian coal field and into the Saar district; also attended an economic allied conference with German representatives at Cologne, as technical advisor on mining matters to the American economic delegation; while there he visited

brown-coal mines in the vicinity of Cologne and bituminous mines in Westphalia. Mr. Rice visited England and Scotland to observe the methods employed in typical coal, iron, and oil-shale mines. He gave special attention, while visiting the French Lorraine iron mines formerly held by the Germans, to the industrial use of liquid oxygen explosives.

E. A. Holbrook served as acting chief mining engineer during Mr. Rice's absence in Europe.

WORK OF THE DISTRICT MINING ENGINEERS.

District A, termed the Northern Appalachian district, covers Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, Ohio, and eastern Kentucky. The headquarters are at Pittsburgh.

J. W. Paul, chief coal-mining engineer, had charge of the field investigations made by the various engineers and of the work pertaining to coal mining at the experimental mine.

During the first half of the fiscal year numerous mines in Arkansas, Oklahoma, Pennsylvania, and West Virginia were examined and sampled in order to obtain necessary data in connection with the fuel requirements of the Navy, Tidewater Exchange, Fuel Administration, and Panama Railroad.

Detailed investigations of explosions and accidents in various mines during the year were made by the district and field engineers, and reports were furnished to the mine owners which outlined changes deemed advisable to insure greater safety. In addition, special investigations were made of the mine-water neutralizing plant at the Calumet mine of the H. C. Frick Coke Co., at Calumet, Pa., and the explosibility of dust in the mills of the Oliver Iron & Steel Co., and the Hubbard Co., at Pittsburgh, Pa.

Methods of mining employed in Alabama, Kansas, Oklahoma, and Pennsylvania are being studied for the purpose of determining the waste of coal in mining and of suggesting methods that may increase the recovery. In Illinois a special study is being made on subsidence of the surface resulting from different methods of mining coal, the object being to recommend a system or practice of mining that may do the least injury to the surface and at the same time insure the greatest recovery. Fires in coal mines are being investigated for the purpose of learning the conditions under which the fires originate and the methods employed for their control and extinction.

District B, termed the Southern Appalachian district, embraces North and South Carolina, Georgia, Florida, Tennessee, Alabama, and Mississippi.

W. B. Plank, mining engineer, was appointed as district engineer, with headquarters at Birmingham, Ala., in November, 1918. He has investigated mine accidents and recommended safety measures to the mine operators. Already one large mine in the district has adopted electric safety lamps in place of the open carbide lamp. Mr. Plank is compiling data on coal-mining methods in Alabama.

District C, the Lake Superior, includes northern Michigan, northern Wisconsin, Minnesota, and the eastern halves of North and South Dakota.

B. O. Pickard, district engineer, Ironwood, Mich., has made a survey of the Lake copper and iron mining districts, meeting mine superintendents and inspectors and investigating safety conditions. He gave considerable time to a proposed cooperation with the State industrial commission of Wisconsin, in drawing up a manual of safety regulations and rules for the mines and quarries in the State. Between July 1 and December 19, 1918, Mr. Pickard had charge of training more than 400 soldier miners at Houghton, Mich., in cooperation with the Michigan College of Mines. On June 19 a safety conference was held at Duluth, Minn., under the auspices of the Bureau of Mines, at which practically all the mining companies in the district were represented and plans were made for the furtherance of safety work and investigations.

District D, the Eastern Interior, covers Indiana, Illinois, Iowa, southern Michigan, western Kentucky, and the eastern and northern part of Missouri.

C. A. Herbert, district mining engineer, Vincennes, Ind., has been occupied in the establishment of the new mine-rescue station at Vincennes. During part of the year he acted as superintendent of the Urbana, Ill., station. At the request of coal operators in Indiana and in Illinois, he gave advice in regard to investigations of accidents and to means of preventing them. Informal cooperation was established with the State mining departments of Indiana and Illinois in furtherance of mine-rescue and first-aid training. Mr. Herbert has prepared a paper on the engineering features of the large new coal mines in Illinois and Indiana. During the year he investigated the probable value of certain coal in West Kentucky and also investigated a mine fire in North Dakota. Under Mr. Herbert's general direction the study of subsidence in the Illinois coal field has been continued and progress made on a report dealing with coal-mine fires in the Central district coal fields.

District E, the Southwestern district, includes the States of Oklahoma, Arkansas, Louisiana, Texas, Kansas, southern Missouri, and eastern Nebraska.

J. J. Rutledge, district engineer, McAlester, Okla., during the year rendered assistance at two mine explosions. He conducted a large

number of tests for miners, fire bosses, and mine superintendents at the safety-lamp testing gallery at the McAlester station and also organized two miners' first-aid demonstrations and tests—one at McAlester on May 30, the other at Pittsburg, Kans., on June 7.

On the segregated coal lands, three shot-firers' accidents occurred. On June 30, 1919, 15 men lost their lives in a gas explosion in No. 5 mine of the Rock Island Coal Mining Co., at Alderson, Okla. This was the most serious mine disaster in Oklahoma since the explosion at the San Boise No. 2 mine, at McCurtain, in 1912.

With the superintendent of the Osage Indian Agency and the superintendent for the Five Civilized Tribes, Mr. Rutledge has been appraising the segregated coal and asphalt lands in eastern Oklahoma belonging to the Choctaw and Chickasaw nations. The work was completed in August, 1918, the total value of the coal and asphalt lands appraised being $14,538,442. Mr. Rutledge has continued to examine coal and mineral leases on all allotted Indian lands for the superintendent of the Five Civilized Tribes.

Progress in the introduction of permissible explosives in the mines of Oklahoma continues. As a result of information given in Technical Paper 154, on proposed improvements in coal-mining methods in Oklahoma, several companies are endeavoring to improve their mining methods with a view of increasing safety and obtaining higher recovery.

An investigation of the efficacy of asphalt coating in preventing the slacking and falling of roofs in mines is in progress. A miners' circular on shot-firers' accidents and a paper dealing with mining conditions on the segregated Indian lands are partly completed.

Districts F and G, the Southern and Northern Rocky Mountain districts, include Idaho and Montana, southern Wyoming, the western halves of North and South Dakota, as well as Colorado, Utah, New Mexico, southwestern Texas, and western Nebraska.

Daniel Harrington, Golden, Colo., district mining engineer, who is in general charge of the Bureau of Mines' safety work in the Rocky Mountain field, has inspected regularly the Gebo mine of the Owl Creek Coal Co., Gebo, Wyo., which is working on Government land under a Government lease. During the year Mr. Harrington completed and submitted for publication, as the outcome of his previous investigations in the Butte district, three reports—one, in cooperation with Dr. A. J. Lanza, of the United States Public Health Service, on miners' consumption; one on ventilation in the Butte district; and one on mine fires in the Butte district. Since April he has been investigating, in cooperation with the Public Health Service, dust and ventilation conditions in Arizona mines.

District H, the Northern Pacific, embraces the States of Oregon and Washington. For purposes of administration the Territory of Alaska is included in the district.

G. W. Evans, district engineer, Seattle, Wash., visited Alaska for the purpose of investigating the Matanuska coal fields and to determine the best methods of possible Government development and mining of the coal. Later he nearly completed a paper on coal mines and coal-mining methods in the State of Washington.

District I, the Southern Pacific district, includes California, Nevada, and Arizona.

H. M. Wolflin, district engineer, San Francisco, Calif., continued on the part of the bureau, the cooperative work, begun in 1918, with the State industrial accident commission of California. By this cooperative agreement Mr. Wolflin, acting as chief mine inspector of California, prepared safety rules and regulations for metal mines, dredges, and quarries. These have received the approval of the bureau and have been put into effect. Mr. Wolflin resigned from the bureau, May 1, 1919, to become chief safety inspector for the California Industrial Commission.

WORK OF C. A. ALLEN.

C. A. Allen, mining engineer, in charge of car 11, was detached from the car and sent to Utah, where a cooperative agreement had been entered into between the Bureau of Mines and the Utah State Industrial Commission, by which the Bureau of Mines was to furnish a mining engineer who should act as chief mine inspector of the State. One half of his salary and expenses were to be paid by each of the contracting parties. While on this work Mr. Allen has been engaged in drafting rules and regulations for the metal mines of the State. These regulations were approved by the Bureau before being adopted by the State and are being put into effect. Rules and regulations for the coal mines are being prepared.

WORK OF C. L. COLBURN.

C. L. Colburn had charge of the Washington office of the mining division in the absence of Mr. Rice, handling official correspondence and helping to coordinate and direct the work of the division and field engineers. Mr. Colburn is writing a bulletin on "Prospecting and Exploration" and is collecting information on underground loading machines in accordance with the recommendations of the interdepartmental committee, known as the "committee on mechanical devices used in mining."

SAFETY AND RESCUE WORK.

FIELD DISTRICTS OF RESCUE STATIONS AND CARS.

In order to conduct the mine-safety work to the best advantage, the mining regions of the country are grouped within eight districts,

planned with especial reference to convenience and efficiency. These districts center around the rescue stations and the headquarters of the rescue and mine-safety cars and do not coincide with the districts of the mining experiment stations of the bureau. The first consideration in locating headquarters of cars and the position of safety stations is that of mine distribution and of railroad facilities.

District headquarters and engineers in charge.

District.	Headquarters.	Engineer in charge.
A	Pittsburgh, Pa.	D. J. Parker, mine safety engineer.
B	Birmingham, Ala.	W. B. Plank, mining engineer.
C	Ironwood, Mich.	B. O. Pickard, mining engineer.
D	Urbana, Ill.	C. A. Herbert, district engineer.
E	McAlester, Okla.	J. J. Rutledge, mine safety engineer.
F	Golden, Colo.	Daniel Harrington, district engineer.
G	Butte, Mont.	Do.
H	Seattle, Wash.	G. W. Evans, mine safety engineer.
I	San Francisco, Calif.	H. M. Wolflin, mine safety engineer.

District A.—Northern Appalachian district. Headquarters are Pittsburgh, Pa., where the work is under the immediate supervision of D. J. Parker, mine safety engineer. At the Pittsburgh station are training galleries and a motor rescue truck that is used in general training in the vicinity. Car 6, with headquarters at Pittsburgh, serves the northern part of the district, and car 8, with headquarters at Huntington, W. Va., serves the southern part of the district. The mine rescue station at Norton, Va., serves the extreme southern part of the district.

District B.—Southern Appalachian district. Headquarters are at Birmingham, Ala., where there is a special Bureau of Mines' building containing a training gallery and an auto rescue truck which is used for training work in the surrounding country. The northern end of the district is served by a station at Jellico, Tenn. W. B. Plank, mining engineer, is in charge of the work of this district.

District C.—Lake Superior district. B. O. Pickard, mining engineer in charge, has headquarters at Ironwood, Mich. Car 7, of an old type, has been serving this district. From June, 1918, to January, 1919, Mr. Pickard trained in mine rescue work about 600 of the soldier-miners stationed at the Michigan College of Mines, Houghton, Mich. A new all-steel car, No. 10, is about to make its initial trip into the Lake Superior district to continue the work of car 7.

District D.—Eastern Interior district. The district headquarters are at Urbana, Ill. C. A. Herbert, district engineer, resides at Vincennes, Ind., where there is a mine safety station equipped with a training gallery and a motor rescue truck. The State of Illinois has its own rescue cars and stations, and the bureau's safety training was done mostly in Indiana except for some cooperative work carried on

with Joseph C. Thompson, chief of the Illinois Department of Mines. Car 3, an old type car, covered the district from its headquarters at Evansville, Ind. A new steel car, No. 9, delivered in May has headquarters at Terre Haute, Ind., to take up the work of car 3.

District E.—The Southwestern district. J. J. Rutledge, district engineer, is in charge with headquarters at McAlester, Okla., where there is a mine rescue station containing a training gallery. During the year the district was served by car 4, with headquarters at Pittsburg, Kans., and car No. 1, an all-steel car, temporarily assigned from the Southern Pacific district.

District F.—Southern Rocky Mountain district. Daniel Harrington, at Golden, Colo., is district engineer. The district is served by car 2, in charge of J. J. Forbes, mining engineer, with headquarters at Raton, N. Mex. The northern part of the district is served by another new steel car, No. 11, with headquarters at Rock Springs, Wyo.

District G.—Northern Rocky Mountain district. The district, in charge of Daniel Harrington, is served by car 5 with headquarters at Butte, Mont., at the Montana School of Mines. The car is in charge of B. W. Dyer, mining engineer.

District H.—Northern Pacific district. G. W. Evans, mining engineer, is in charge of the district, which embraces the States of Washington and Oregon. Headquarters are at Seattle in the Bureau of Mines experiment station, F. K. Ovitz, superintendent. The station has a training gallery and a motor rescue truck which is used for near-by training under the charge of a foreman miner. For purposes of administration the Territory of Alaska is included in this district.

District I.—Southern Pacific district. H. M. Wolfin, mining engineer, who also serves as chief mine inspector of the State of California with headquarters at the office of the California Industrial Commission, San Francisco, Calif., is in charge. The district was served by car 1, in charge of E. D. Gardner, mining engineer, with headquarters at Reno, Nev., prior to the transfer of the car to the Southern District.

The itineraries of the safety cars and rescue trucks are arranged by the engineers or by the foremen in charge with the concurrence of the district engineers and the approval of D. J. Parker, mine safety engineer, in general charge at Pittsburgh, Pa.

The testing work of the mine safety section comprised the testing of various kinds of mine-rescue apparatus. At the Pittsburgh station these gallery tests were conducted by G. S. McCaa, mining engineer, under the general supervision of D. J. Parker, during regular schedules of training.

RESCUE AND FIRST-AID INVESTIGATIONS AND TRAINING WORK.

The duties of the engineers, foreman miners, and first-aid miners in mine-rescue and first-aid work were chiefly rendering aid at mine disasters, training miners in rescue and first aid, conducting first-aid and mine rescue field contests, and training soldiers at military camps.

The nine mine rescue cars were busy in training work during practically the entire year, although the epidemic of influenza curtailed work somewhat during October and November, 1918. During this epidemic the crews of the various cars offered their services to the hospitals in the vicinities of their headquarters, and did creditable work nursing the sick. The training done through the stations and the four rescue trucks continued as usual.

An important duty of the men is to inspect rescue apparatus owned by mining companies, and to give advice, on request, as to its condition and the repairs needed. Many of the apparatus inspected are so defective that if used in an irrespirable atmosphere at the time of an emergency or disaster they would probably cause the death of wearers. The field men always warn operators of such defects and emphasize the need of having the apparatus examined and tested monthly.

During the year a total of 58,135 persons visited the mine safety cars and stations, and 82,036 attended the lectures given by the crews of the mine-rescue cars and stations.

Details of instructions, training, and demonstrations given by the foreman miners and the first-aid miners are shown in the following tables:

Record of training for the year July 1, 1918, to June 30, 1919.

Cars and stations.	Qualified certificates.				Additional training.			
	Combination.	First aid.	Mine rescue.	Total.	Combination.	First aid.	Mine rescue.	Total.
Car 1	189	168	20	377	46	38	7	91
Car 2	163	902	84	1,149	8	39	10	57
Car 3	187	741	15	943	.....	9	.....	9
Car 4	24	10	.....	34	19	2	2	23
Car 5	172	470	72	714	11	46	11	68
Car 6	351	1,060	73	1,484	44	237	3	284
Car 7	162	406	479	1,047	10	23	10	43
Car 8	149	344	18	511	26	16	.....	42
Car 9	42	42	9	93	.....	.....	.....	.....
Pittsburgh	96	386	47	529	11	10	1	22
Norton	89	750	36	875	7	55	2	64
Jellico	24	476	.....	500	.....	51	.....	51
Birmingham	56	128	34	218	12	16	5	33
McAlester	2	25	2	29	.....	32	.....	32
Seattle	215	81	.....	296	.....	2	.....	2
Vincennes	39	92	3	134	8	17	2	27
Total	1,960	6,081	892	8,933	202	593	53	848

The number of visitors who inspected the cars and stations and attended lectures given by bureau employees during the year is shown by the table below.

Number of persons visiting cars and stations and attending lectures.

	Number of visitors.	Number attending lectures.
Car 1	5,578	5,387
Car 2	23,307	4,881
Car 3	2,758	696
Car 4	24,458	45,676
Car 5	3,387	5,230
Car 6	10,464	10,436
Car 7	2,196	210
Car 8	1,832	3,740
Pittsburgh station	426	135
Birmingham station	379	1,477
Jellico station	33,313	.....
McAlester station	364	457
Seattle station	611	3,553
Norton station	51	160
Vincennes station	11	48
Total	58,135	82,086

EXHIBITS AT STATE FAIRS.

The mine rescue cars of the Bureau of Mines participated in seven State fairs held during the summer and fall of 1918 and gave demonstrations in mine-rescue work during intervals. The fairs are named below:

Cars that gave demonstrations at State fairs.

Car 4—Missouri State Fair, Sedalia, Mo.
Car 4—Kansas Free Fair, Topeka, Kans.
Car 4—Oklahoma Free State Fair, Muskogee, Okla.
Car 3—Illinois Centennial State Fair, Springfield, Ill.
Car 3—Iowa State Fair, Des Moines, Iowa.
Car 5—Wyoming State Fair, Douglas, Wyo.
Car 6—New York State Fair, Syracuse, N. Y.

MINE ACCIDENTS INVESTIGATED.

During the year 29 mine accidents were investigated, 19 at coal mines and 10 at metal mines.

A list of the mine accidents investigated during the year appears in the table following.

Accidents investigated in the fiscal year ending June 30, 1919.

Name of mine.	Location.	Date.	Killed.	Injured.	Rescued.	Escaped unassisted.	Apparatus used.	Hours apparatus worn.	Died wearing apparatus.	Nature of accident.	Inspected by—
		1918.									
No. 8	Sturgis, Ky	July 24	1				16	1½		Mine fire	G. T. Powell.
No. 2, Quincy	Hancock, Mich	July 14					9	12		do	J. Matthews.
Blackfield	Blackfield, Pa	July 18	1	12						Powder-magazine explosion.	S. P. Howell.
Penn	Smithfield, Pa	do	4							Roof cave-in	L. D. Tracey.
Penn	Mendota, Wash	July 20								Mine fire	K. H. Chisholm.
Harmar	Harmarville	Aug. 7	5	5	3		11	5		Gas explosion	G. S. McCaa, B. W. Dyer, J. H. Zorn, J. J. Bourquin.
O'Gara No. 10	Eldorado, Ill	Aug. 14	2	2			11	5		Gas and dust explosion.	W. B. Plank.
North	Royalton, Ill	Sept. 28	22	1	1	13	30	12		Gas explosion while fighting fire.	Do.
Jackson-Walker Coal Mining Co.	Franklin, Kans	Nov. 2	4		4		16	3½		Shot-firers' explosion	J. J. Rutledge.
Key West	St. Thomas, Nev	Nov. 7	1							Fall, drowning in shaft	S. A. Young.
Havaco	Havaco, W. Va	Dec. 21	4			3	6		2	Explosion	E. D. Gardner, R. Lilly.
		1919.									
Mount Braddock	Gist, Pa	Jan. 20	2	4	6		25	120		Mine fire	Car 6 and D. J. Parker, G. S. McCaa, E. D. Gardner, J. H. Zorn, E. H. Denny, W Freeman.
Belgrade	Biwabik, Minn	Feb. 1	1	10	14	45	21	20		do	B. O. Pickard, J. Matthews, M. G. Hoyman.
Acmar No. 3	Acmar, Ala	Feb. 7		8	32		2	1		Gas explosion	W. B. Plank.
Brick Yard	Hebron, N. Dak	Feb. 10								Mine fire	Car 5.
Empire	Auguilar, Colo	Mar. 13	13			23	10	8		Gas explosion	D. Harrington.
Miller	Aurora, Minn	Mar. 31	1							Cave	E. A. Sporley.
Armour No. 2	Crosby, Minn	Mar. 17	2							Delayed shot	Do.
Manning	Manning, Okla	Apr. 12	1							Shot-firers' accident	J. J. Rutledge.
Caspian	Palatka, Mich	Apr. 15	2							Cave	J. Matthews.
Omaha	Woodrow, Mich	Mar. 18	1							Fall of rock	E. A. Sporley.
Utica	Hibbing, Minn	Mar. 19	1							Not known	Do.
Argonaut	Jackson, Calif	Mar. 27		8	8		24			Mine fire	H. M. Wolflin. Car 5, B. W. Dyer.
Kennedy	do	do					24	3 wks.		Gas leak	Car 5, B. W. Dyer.
Majestic	Majestic, Ala	Apr. 29	21	7						Gas explosion	W. B. Plank and J. M. Cobb.

Baltimore No. 2 tunnel.	Wilkes-Barre, Pa.	June	5	93	43	43	7				Black-powder explosion.	D. J. Parker, G. S. McCaa, J. Henson, S. P. Howell, A. C. Illsley, J. Leyman.
Dietz No. 8	Dietz, Wyo.	June	3	2			5				Ignition of gas	J. J. Forbes.
Cannon	Franklin, Wash.	June	22								Mine fire	B. W. Dyer.
Alderson No. 5	Alderson, Okla.	June	30	15			115				Gas explosion	W. W. Fleming.

These accidents may be classified by causes as follows:

Classification of accidents investigated.

Gas and dust explosions	10	Fall of rock	1
Fires	8	Drowning	1
Cave-in	3	Powder explosion	2
Delayed shots and overcharged holes, including accidents to shot-firers	3	Unknown	1

TOWNS AT WHICH MINE RESCUE AND FIRST-AID TRAINING WAS GIVEN DURING THE YEAR ENDED JUNE 30, 1919.

A list of the towns where training was given during the year follows:

Alabama.—Porter, Ensley, Margaret, Acmar, Coalmont, Blocton, Sayre, Bessemer, Acton, Dora, Graysville, Republic, Altoona, Sayreton.

Arkansas.—Greenwood, Hackett, Hartford, Russelville, Hartman, Denning.

California.—Jackson, Sutter Creek, Amador, Palo Alto, Berkeley, Grass Valley.

Colorado.—Morley, Victor, Leadville, Climax, Breckenridge, Gilman, Smuggler, Telluride, Gray Creek, Eureka, Hespers, Silverton, Salida, Oak Creek, McGregor, Haybro, Mount Harris, New Castle, Bloomfield, Sopris, Decona, Frederick, Georgeton, Silver Plume, Superior, Gorham, Louisville, Ravenwood, Cameron, Delagua, Bon Carbo, Berwind, Empire, Somerset, Valdez, Lafayette, Starkville.

Georgia.—Chastatee.

Illinois.—Duquoin, Herrin, Athens, Springfield, Eldorado, Equality, Norris City, Galatia, La Salle, Virden, Edwardsville, Tovey, Hanna City, Glasford, Peoria, East Peoria, Pekin, Sparland, Kincaid, Carlinsville.

Indiana.—Oakland City, Evansville, Vincennes, Bruceville, Bicknell, Carlisle, Coal Bluff, Shelburn, Jerico, Pleasantville, Dugger, Cass, Everhardt, Jacksonville.

Iowa.—Hiteman.

Kentucky.—Chavies, Staub, Blue Diamond, Jackson, Hazard, Lothair, Bartonville, Millstone, Glamawr, Fleming, Basket, Jenkins, Divernon, McRoberts, Henderson, Greenville, Graham, Majestic, Kettle Island, Hellier, Pinson Junction, Belfry, Henry Clay, Twila, Kentenia, Stone, Wolfpit, Van Lear, Tinsly, Pineville, Toler, Thealk, Vanilla, Prestonburg, Hardy, McCann, Keyser, Balkan, Aflex, Grays Knob, Harlan, McVeigh, Westburne.

Kansas.—Lawrence, West Mineral, Yale, Arma, Franklin, Washer Camp, Dunkirk, Cherokee, Fleming.

Michigan.—Houghton, Hubbell, Mass, Baltic, Trimountain, Painsdale, Mohawk, Kearsage, Gay, Hancock, Norway, Vulcan, Loretta, Stambaugh.

Minnesota.—Biwabik.

Missouri.—Rich Hill, Rolla, Wasco.

Montana.—Butte, Red Lodge, Washoe, Gebo, Carpenter Creek.

Nevada.—Reno.

New Mexico.—Tyrone, Santa Rita, Fierro.

North Dakota.—Wilton, Burlington.

Oklahoma.—Henryetta, Dewar, McCurtain.

Pennsylvania.—Emigh, St. Benedict, Clymer, Glen Rickey, Winburne, Nanty Glo, Portage, Lilly, Cresson, Cassandria, Expedit, Colver, Vandergrift, Leechburg, Crucible, Waltersburg, Edri, Elmora, Barnesboro, Dunlo, South Fork, Patton, Gist, Houtzdale, Surveyor, Punxsutawney, Eleanor, Tyler, Sykesville, Graceton, Coral, Mooween, Argentine, Yatesboro, Beaverdale, Hastings, Codagan, Arcadia, Birchbald, Greensburg, Pittsburgh, New Boston, Girardsville, Mahoney Plane, Locust Mountain, Natalie, Beaver Creek, St. Clair, Orient, Primrose, Windber.

South Dakota.—Trojan, Lead.

Tennessee—Westburne, LaFollette, Anthreas, Pruden, Mascott.

Texas.—Thurber, Dolores.

Utah.—Bingham, Eureka, Park City, Alta, Cardiff, Scofield, Castlegate, Storrs, Standardville.

Virginia.—Blackwood, Essenville, Glamorgan, Wise, Toms Creek, Virginia City, Inman, Norton, Beaver Creek, Clinchfield, Dante, Wilder, Pardee, Trammel, Jewel Ridge, Red Ash, Parrott, Pocahontas, Dorchester, Merrimac, Benedict, Roda, Stonega, Arno, Inboden, Exeter, Dunbar.

Washington.—Seattle, Roslyn, Durham, Ladd, Renton, Coal Creek, Tono, Black Diamond, Wilkeson, Barnett, Chehalis.

West Virginia.—Monongah, Morgantown, Powellton, Stanaford, Grant Town, Baxter, Weldon, Hartford, Mawon, Clovemont, Raleigh, Wickham, Eccles, Moundsville, McMechen, Benwood, Beechwood, McKinleyville, Wellsburg, Colliers, Williamson, Red Jacket, Thacker, War Eagle, Panther, Welch, Gary.

Wisconsin.—Niagara.

LIST OF MEN TRAINED.

A technical paper giving a list of the men who received Bureau of Mines certificates of mine rescue training during 1916 and 1917 was sent to press.

PHYSICAL TESTS OF EXPLOSIVES.

Physical test of explosives are made at the experimental mine, near Bruceton, Pa. Owing to the demands of the War Department on the testing laboratories, all regular work for the mining industry was discontinued until after the signing of the armistice, when such work was resumed.

During the year two new explosives were placed on the permissible list. On June 30, 1919, the list contained the names of 162 explosives, as compared with 160 on June 30, 1918.

The special tests and investigations made during the year are mentioned below.

ADAPTATION OF T N T TO COMMERCIAL USES.

Work by A. B. Coates, assistant mechanical engineer, J. E. Tiffany, assistant explosives engineer, and W. J. Montgomery, junior explosives engineer, showed that T N T could be successfully used for certain commercial uses. This investigation required approximately one month's time.

WATER-RESISTING PROPERTIES OF GRADES I, II, AND III OF T N T.

Work done by E. Stein, junior explosives engineer, with special reference to the use of T N T in wet holes showed that Grade III, T N T, had the better water-resisting properties and could be used after moderate immersion in wet holes. This investigation required approximately 6 weeks' time.

DESENSITIZATION OF GRADE I, T N T.

Mr. Stein made tests to determine safe methods of storing the large stock of T N T now on hand in this country. The results show that water was the best agent. The investigation required two months' time.

CRSTALLIZING TEMPERATURE OF AMMONIUM NITRATE.

The Bureau of Mines is cooperating with the Aetna Explosives Co. (Inc.) to determine the effect of the crystallizing temperature of ammonium nitrate on the safety and strength of permissible explosives containing that substance. This work is being done by J. E. Crawshaw, explosives testing engineer, and will be continued during the coming fiscal year.

NEUMANN BANDS IN STEEL.

The effect of the speed of deformation or rupture of steel on the character and number of Neumann bands formed is being investigated in cooperation with the Council of National Defense, by S. P. Howell, explosives engineer. The investigation will be continued during the coming fiscal year.

DENSITY OF LEAD AFTER USE IN THE SMALL LEAD-BLOCK TESTS.

Work by A. B. Coates, assistant mechanical engineer, demonstrated that the lead in the blocks used had a less density after the test than before.

EXPLOSIONS INVESTIGATED.

Investigations were made with reference to the cause of the following explosions:

1. T N T plant, Semet Solvay Co., Syracuse, N. Y., July 2, 1918.
2. Magazine of Atlantic Coal Co., Blackfield, Pa., July 17, 1918.
3. T N T plant, Hercules Powder Co., Kenvil, N. J., August 7, 1918.
4. Motion picture films, Sauer Building, Pittsburgh, Pa., January 7, 1919.
5. Gautier mine, Citizens Coal Co., Johnstown, Pa., May 16, 1919.
6. Pittsburgh Steel Co., Monessen, Pa., May 24, 1919.
7. Delaware Hudson Coal Co., Wilkes-Barre, Pa., June 5, 1919.

PUBLICATIONS.

Special reports and an emergency bulletin were prepared as follows:

A technical paper on sensitiveness of explosives to frictional impact, with special reference to results of tests of explosives with the Bureau of Mines pendulum friction device; an emergency bulletin on T N T as a blasting explosive; a technical paper on characteristics and preliminary tests of liquid-oxygen explosives; a special report of tests made to determine the height and duration of flame of mercury fulminate; and a special report on substitutes for mercury fulminate for detonators.

PERSONNEL.

The physical tests of explosives were in charge of S. P. Howell, explosives engineer, aided by J. E. Crawshaw, explosives testing engineer, J. E. Tiffany, assistant explosives engineer, W. J. Montgomery, junior explosives engineer, and Charles Schuler, shot-firer, throughout the year, and A. B. Coates, assistant mechanical engineer, J. L. Sherrick, explosives engineer, and E. Stein, junior explosives engineer, during various parts of the year.

EXPERIMENTAL MINE.

EXPLOSIBILITY OF COAL DUST.

The study of the factors governing coal-dust explosions, and the development of methods for preventing or stopping explosions was continued at the experimental mine, near Bruceton, Pa., though restricted by war work during the early part of the fiscal year. Explosion tests were made with two subbituminous coals from Colorado. Tests of barriers were made in connection with these explosions.

After the resignation of W. L. Egy, physicist, in October, 1918, the work was conducted by H. C. Howarth, coal-mine superintendent, and H. P. Greenwald, assistant physicist, under the direction of J. W. Paul, chief of coal-mine investigations, and G. S. Rice, chief mining engineer. The laboratory work was conducted by Alan Leighton, assistant (physical) chemist under the direction of Messrs. Paul and Rice.

USE OF GEOPHONES.

During the period of the war, experiments with the geophone were made in cooperation with Capt. E. B. Stephenson, United States Engineers, to determine the distances that various sounds could be detected through the earth and the factors influencing the transmission of energy from a blow to the earth.

An investigation of the value of the geophone for mine rescue and mine-survey work is nearly completed. The instrument has been considerably improved over the form employed by the War Department and has been successfully used in locating mine fires, mining in drifts, and raises and leaks in water pipes. The investigation has shown that the instrument will be of great value for locating entombed miners.

GALLERY TESTS OF COAL DUST AND INDUSTRIAL DUSTS.

The horizontal dust-explosion gallery at Bruceton has been used to test the inflammability of a number of samples of coal dust. Re-

ports on the inflammability of steel-mill dusts, coke dust, pitch dust, and other dusts have been made. In the course of some cooperative work on the explosibility of grain dusts with Dr. H. H. Brown of the Bureau of Chemistry a new vertical dust explosion gallery was constructed, which will be of value in testing the inflammability of dust clouds by different flames.

Supplementary to a paper by G. B. Taylor and H. C. Porter on the Momentary Heating of Inflammable Dusts, H. L. Lentz, assistant chemist, has been gathering data on the volatile matter in a dust during an explosion and has done some experimental work.

FUELS AND MECHANICAL EQUIPMENT DIVISION.

During the year, the building and moving program of the laboratories at Pittsburgh being practically complete, the headquarters of the chief mechanical engineer, O. P. Hood, was transferred to Washington.

WORK OF CHIEF MECHANICAL ENGINEER.

The following work was directly conducted from the Washington office by the chief mechanical engineer.

COOPERATION WITH UNITED STATES FUEL ADMINISTRATION.

The bureau continued to function in an advisory capacity to the fuel conservation section of the Unites States Fuel Administration. A study of possible coal standards was made in connection with the matter of bunker coal.

The several functions of the Fuel Administration having to do with fuel conservation were examined, with a view to possible continuance of those proving successful and desirable.

SPECIFICATIONS FOR FUEL INSPECTION.

A system of Federal fuel inspection was devised fitting the present needs of producers and consumers. A bill authorizing such work was prepared.

UTILIZATION OF LIGNITE.

An investigation of lignite under a bill appropriating $100,000 for the purpose (Public, No. 259) was begun and a plan of procedure was outlined as well as a study of plant detail. A field investigation in Texas and the Dakotas revealed cooperating facilities aggregating several times the amount of the Government appropriation. S. M. Darling, fuel engineer, assisted in this work.

COOPERATION WITH AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

Cooperation was arranged with the American Society of Heating and Ventilating Engineers to conduct joint research work at the Pittsburgh laboratories of the Bureau of Mines on matters pertaining to the efficient use of fuels.

COOPERATIVE TESTS OF COKE OVENS.

Jointly with the Bureau of Standards and at the direction of the President, a test of Illinois coal was made in a Roberts by-product coke oven at Dover, Ohio. A similar test was also made in a Koppers oven at St. Paul, Minn. F. K. Deitz and W. A. Selwig assisted in this work.

GOVERNMENT FUEL INSPECTION.

The work of inspecting fuel purchased for the Government was under the direction of George S. Pope, engineer, for three months, and H. M. Cooper, assistant chemist, nine months. They were assisted by Ned H. Snyder, assistant engineer; H. A. Goodman and R. J. Swingle, inspectors. Coal for the Panama Canal and the Panama Railroad Co., and mines in Kentucky and Tennessee were inspected and sampled. Assistance was rendered the United States Fuel Administration and State fuel administrations. The offices of this section, and the fuel-inspection laboratory are situated at Washington.

The fuel-inspection laboratory was under the supervision of H. M. Cooper, assistant chemist, aided by E. L. Wallace, assistant chemist, Geo. Bornscheuer, W. A. Gonzalez, H. R. Dunbar, F. C. Hull (resigned), and R. N. Crow, junior chemists; G. F. Pfeffer (resigned) and H. P. Rue, chemical laboratorians. The work of the laboratory consisted of analyzing coal belonging to or for the use of the United States Government, and coal samples for the United States Fuel Administration and State fuel administrations, and for State institutions under cooperative agreements. During the year equipment for determining the fusing temperature of ash was added to the laboratory, and improvements were made in the multiple-unit calorimeter installation.

WORK CONDUCTED FROM THE PITTSBURGH STATION.

The following work was conducted from the Pittsburgh office, under the general supervision of the chief mechanical engineer and the immediate direction of Henry Kreisinger, engineer.

COOPERATIVE WORK WITH UNITED STATES SHIPPING BOARD.

In February, 1918, under an agreement with the Emergency Fleet Corporation the bureau undertook to make all temperature measurements and furnace-gas analyses at tests of marine boilers of different design for the Emergency Fleet. The first boiler tested was at the Erie City Iron Works, Erie, Pa., 22 tests being made with George's Creek coal. The temperature measurements indicated that the performance of the boiler could be improved by making changes in the furnace and baffles. As a result of such changes the over-all boiler efficiency was raised from about 60 to 72 per cent, this high efficiency of 72 per cent being obtained when the boiler evaporated 5½ to 6 pounds of water per square foot of heating surface, a rate considerably higher than the practice in the average stationary plant. Thus the fuel section helped in developing a highly efficient boiler and also obtained much data of practical value.

The next boiler tested at the Murray Iron Works, Burlington, Iowa, was of the water-tube type, fitted with a superheater. In all, 32 tests were made with oil and 12 with coal. The oil tests were made with Dahl and Coen burners.

The third boiler was tested at the plant of the Erie City Iron Works, 22 tests being with a hand-fired furnace and 10 tests with an E-type underfeed stoker. Another series of tests is now in progress with fuel oil and several designs of oil burners.

A Scotch marine boiler is to be tested at the plant of the Sun Shipbuilding Co. at Chester, Pa., using coal and oil, and several designs of oil burners. When these tests are completed the comparative performances of water tube and Scotch marine boilers will be available for study. No reliable data for such comparison has ever been obtained before.

These investigations were in charge of W. R. Argyle, assistant physicist, who had the aid of A. R. Mumford, assistant engineer; W. H. Miller, junior chemist; J. R. Darnell, laboratory assistant; and J. P. Stein, fireman.

POWDERED COAL.

A general survey of the use of powdered coal is planned, the purpose of this survey being the preparation of a bulletin giving the facts without bias. Many of the published articles on powdered coal were prepared by people interested in manufacturing powdered coal equipment, and some of the information in such articles is misleading.

Arrangements have been made with the Erie City Iron Works for cooperative research to determine how boiler furnaces should be designed to eliminate the troubles at present met in burning pow-

dered coal. Particular attention will be given to the formation of slag in the furnace and the disposal of ash. These investigations will be in charge of A. R. Mumford, assistant engineer, assisted by D. J. Jenkins, fuel engineer, and R. J. Hinch, laboratory aid.

USE OF FUEL FOR DISTILLING OIL.

In cooperation with the Sinclair Refining Co. of Chicago, a thorough test is being made of several oil stills fired by different types of stoker in order to determine what design of furnace will utilize the fuel most efficiently. It is planned to make a complete heat balance of the performance of each oil still and each design of furnace. This work is in charge of W. R. Argyle, assistant physicist, assisted by Marcus Sturve, assistant chemist, and J. R. Darnell, laboratory assistant.

COKE FOR HOUSE-HEATING PURPOSES.

Tests have been started to determine the best method of burning domestic-size coke in the heating apparatus now used in dwellings. Tests will be made in steam boilers of several makes, in hot-air furnaces, heating stoves, and open grates—comparative tests being run with coke, anthracite coal, and high-volatile bituminous coal. Another series of tests will be made to determine the principles governing the design of apparatus for burning coke. These investigations will be made in cooperation with several coke-producing companies and designers of by-product plants. Part of the work will be done at the Minneapolis station.

Alfred Iddles, fuel engineer, will be in charge of the work at Minneapolis, assisted by two men paid by the Koppers Company. The work at the Pittsburgh station will be in charge of C. E. Augustine, assistant engineer, aided by H. W. Jarrett, assistant engineer, Charles Schramm, mechanic, and J. P. Stein, fireman.

HEAT-TRANSMISSION INVESTIGATION.

The object of this investigation is to determine the effect of the various factors governing the transfer of heat from the hot furnace gases into the water of a steam boiler. The plant for the work, consisting of a tubular boiler 20 feet long and a gas furnace, is being rebuilt, with some modifications, in the new fuels-testing laboratory at the Pittsburgh station. The temperature of the gases before entering the boiler, along the path of heat flow, and after leaving the boiler, and the volume of the gases passing into the boiler tubes will be measured precisely.

In connection with the heat-transmission investigation the relative heat conductivity of "sil-o-cel" and fire brick in a furnace wall, will

be tested by determining the temperature drop through 5-inch and "sil-o-cel" walls under conditions of temperature equilibrium.

This investigation is being conducted by F. C. Houghton, assistant physicist.

COMBUSTION TESTS.

Tests relating to combustion of coal in a modified hand-fired furnace with a water-cooled arch were made in order to obtain data on effect on the combustion process of a water-cooled surface as compared with a fire-brick arch.

Two types of boiler furnaces, the side feed and the hand fired, have been tested at the Pittsburgh station. The underfeed type will be tested under a marine boiler in the new laboratory.

During the year a technical paper entitled, "Combustion Experiments with North Dakota Lignite," was published.

These combustion tests are in charge of C. E. Augustine, assistant engineer.

SAFE EQUIPMENT IN MINES.

A study of mine equipment, especially hoisting ropes and safety catches, was resumed in the latter part of the year. A study of safety gates in mines was begun. A technical paper on the use of wire rope in mines was written and is now in press. This work was conducted by Mr. Hood and R. H. Kudlich, mechanical engineer.

DIVISION OF MINERAL TECHNOLOGY.

As has been stated, most of the personnel of this division had been transferred to work on war minerals.

Dr. C. L. Parsons, chief of the division, devoted much time to cooperative work with the War Department in connection with the development and erection of plants for the manufacture of nitric acid and sodium cyanide, described elsewhere. He served as a member of the advisory board to the Director of the Bureau of Mines on gas-warfare problems, which was established in November, 1917, by the Secretary of the Interior.

Dr. Parsons initiated and had charge of the cooperative work of the American Chemical Society and the Bureau of Mines for obtaining a census of the country's chemists for use in connection with the special war needs of the Army and Navy. During the first year of the war most of the chemists used as such in warfare were obtained through this organization.

ALLOY STEELS.

Work on alloy steels continued at the Ithaca, N. Y., office during the year, under the direction of Dr. H. W. Gillett, alloy chemist. A brief summary of this work and its results appears on page 764.

As the result of a question arising as to the light armor used in airplanes and tanks, a cooperative investigation of ferrozirconium and of zirconium steel as light armor was arranged with the Navy and the Bureau of Standards. This investigation was in charge of the Bureau of Mines, C. L. Parsons, chief chemist, acting as chairman of the joint board.

Samples of ferrozirconium and of some 60 steels alloyed with zirconium were produced by the Bureau of Mines and subsequently tested by the Bureau of Standards.

METALLURGICAL DIVISION.

As stated on a preceding page, the metallurgical work of the Bureau of Mines during the fiscal year 1918–19 may be divided into two classes, namely, war work and investigations having for their object the development of processes for the prevention of waste.

The work of the metallurgical division during the fiscal year 1918–19 was conducted by F. G. Cottrell, chief metallurgist, with headquarters at Washington, D. C., and by metallurgists whose work for the most part is in connection with the mining experiment stations at Minneapolis, Minn.; Golden, Colo.; Salt Lake City, Utah; Tucson, Ariz.; Berkeley, Cal.; Seattle, Wash.; and Fairbanks, Alaska. The work of these metallurgists is summarized under the chapters dealing with the experiment stations.

WORK FOR THE ORDNANCE DEPARTMENT OF THE ARMY.

For some months before the signing of the armistice and for a while thereafter the inspection of work for the Ordnance Department of the Army was continued at the Bureau of Mines station at Pittsburgh. The Ordnance Department looked after the physical and chemical tests, whereas the metallurgical tests were made by the Bureau of Mines. Dr. F. B. Laney was in charge of this work for the bureau, assisted by C. Y. Clayton, from the Missouri School of Mines, and by several laboratory assistants. Later F. B. Foley assisted with the work and subsequently had charge of it.

WORK ON MANGANESE.

Practically the entire time and attention of the metallurgists connected with the Minneapolis station were given to the study of the problems connected with the production of ferromanganese and other manganese alloys from domestic ores, as mentioned on page 741.

During the war importation of manganese ores from Brazil was curtailed and domestic ore used instead. As the most of the domestic ores are low grade and many of them are siliceous, steel makers had to change their practice in order to utilize the alloys manufactured

from these low-grade ores and it was to the problems relating to the use of such alloys that the metallurgists of the Minneapolis station gave their time.

At the other stations of the bureau, such as Salt Lake City, Berkeley, and Seattle, problems connected with the production or beneficiation of ores needed for war purposes were given first consideration, as, for example, the concentration of manganese and chrome ores, or the production of high-grade graphite.

IRON AND STEEL.

The iron industry covers a wide field and has devoted much research to the many problems within its field, hence the Bureau of Mines has not felt that the problems of iron and steel manufacture demanded as much attention as those of mining or of other metallurgical work. It has investigated the hazards to which workmen are exposed at blast furnaces and steel plants and published the results of the investigations. It is hoped that Congress will provide funds enough to enable the bureau to investigate iron and steel problems at its Pittsburgh station also. Pittsburgh is one of the great iron and steel centers of the world, and whenever the necessary funds are made available, many lines of investigation can follow with results that should be of high benefit to the industry.

HEAT TREATMENT OF STEEL.

The bureau cooperated with the Bureau of Standards and the National Research Council on work for obtaining information and for solving of problems connected with the heat treatment of steel. F. B. Foley, who was assigned to this work during the latter half of the fiscal year, is to continue it during the fiscal year 1920.

IRON ORES.

Throughout the United States are deposits of iron ores too low grade to permit profitable smelting at present. If these low-grade deposits could be utilized, the iron ore reserves of the country would be enormously increased. In order to obtain the iron from these ores it is necessary to do one of two things: (1) Remove enough of the gangue material and impurities to bring the iron content up to the percentage required for profitable smelting, or (2) devise a commercial process for treating ores of lower grade than those being treated by present blast-furnace methods.

At present the bureau's metallurgical work on iron is centered at the Minneapolis station and is being conducted in cooperation with the school of mines, University of Minnesota, and the State mining experiment station. Before the establishment, in 1917, of the bu-

reau's station at Minneapolis, the State mining experiment station had already given considerable study to the washing and concentration of the iron ores of the Mesabi Range. In many places on that range the commercial ores are intimately associated with ores too low in iron to permit their utilization, hence the problem becomes that of finding suitable ways of separating the two grades, and of bringing the iron content of the low-grade ore up to commercial grade.

Individuals and corporations have given attention to the beneficiation of iron ores high in phosphorus and sulphur, as well as low in iron, and at least one process has been devised that promises to be highly successful in raising the iron content and removing the phosphorus. Because of this fact, and because the work done by the Minnesota State mining experiment station promises to solve the problem of washing and concentrating low-grade minable ores, the Bureau of Mines has not attempted to begin any work on the beneficiation of low-grade ores, but is giving its attention rather to the devising of commercially feasible processes for reduction of those iron ores that are too low grade for blast-furnace smelting. Evidently, the development of successful processes for the beneficiation of low-grade iron ores will assist in solving the second phase of the problem, for an ore might be too low grade for blast-furnace smelting but after beneficiation be high enough in iron for reduction by some other process. Hence, the bureau believes it is justified in studying ways and means of preventing metallic waste, in giving especial attention to new processes for the production of iron, and in investigating the merits of processes already suggested for that purpose.

TREATMENT OF LOW-GRADE AND COMPLEX ORES OF THE NONFERROUS METALS.

In 1913 the Utah Legislature created a department of metallurgical research in the school of mines of the University of Utah. The authorities of that institution arranged with the Federal Bureau of Mines a cooperative agreement whereby the bureau would have charge of whatever investigative work was carried on by the university for the purpose of devising processes for treating the low-grade ores in which the State abounds. Work began in January, 1914, and has since been carried on continuously. The results are most encouraging, as many processes have been devised. Some of these have already been applied commercially, and plans for using others are being made. Moreover, the bureau proposes to make a careful study of the problems related to low-grade and complex ores throughout the country, in order to determine how processes worked out on a laboratory scale at the Salt Lake City station may be applied elsewhere.

PETROLEUM DIVISION.

GENERAL STATEMENT.

The staff of the petroleum division was engaged in work relating to war problems until November 11, 1918. In this work the bureau cooperated with the Navy and War Departments, United States Fuel Administration, United States Shipping Board, Treasury Department, and other Government agencies. The bureau continued its work of conservation and educational campaigns among operators, as far as funds were available, although war work was always considered first.

After the signing of the armistice, effort was made to turn rapidly from a war to a peace basis. Now the petroleum division is confronted with additional problems started during the war by the Fuel Administration. The industry expects these to be continued by the Government during peace.

Chester Naramore, as chief petroleum technologist, directed the petroleum division until February 1, 1919, when he was succeeded by J. O. Lewis. Mr. Naramore was in Europe during July, August, September, and October, 1918, as a representative of this Government in matters concerning the handling, disposition and quality of petroleum and its products for the allied countries. During his absence, both A. W. Ambrose and C. H. Beal acted in his place.

The work of the petroleum division is classified at present under four heads: Production technology, engineering technology, chemical technology, and oil shale technology.

Two or three men devoted their entire time to production technology in California, Illinois, Oklahoma, and Wyoming, and effected considerable saving of petroleum by instituting better practice in drilling and production. Cooperative work was carried on with the Office of Indian Affairs, the General Land Office, and the States of Illinois and Colorado.

The petroleum division cooperated with the Internal Revenue Bureau of the Treasury Department and gave it a new method for estimating the future and ultimate production of oil properties throughout the United States. The Treasury Department used this in calculating depletion allowances in taxation.

The petroleum technologists assisted in the investigation of the more important gas fields in the United States in order to determine the possible supply of helium for balloons and airships. Plans and specifications for oil storage were supplied to the Army and Navy.

Two petroleum engineers were sent to Europe to assist and act with the other American members on the Inter-Allied Petroleum Conference, a subsidiary body of the Allied Maritime Transport Council, dealing with the supplies, stocks, specifications, storage,

transportation, and allocations of petroleum products for the allied countries and the American Expeditionary Force. They represented the division of planning and statistics of the United States Shipping Board and the oil division of the United States Fuel Administration on the Inter-Allied Petroleum Conference, and acted as representatives of the Bureau of Mines in Europe. Considerable work was done on the standardization of petroleum products.

A careful study was made of the shale oil plants in Scotland, and the economic possibilities of the oil shale in this country have been studied.

Samples of crude oil from different fields in the United States were collected for analysis. Samples of gasoline from all of the larger marketing concerns were collected for analyses in order to determine the properties of commercially marketed gasoline and as a guide in future work on specifications.

PRODUCTION TECHNOLOGY.

MODES OF OCCURRENCE OF GAS, OIL, AND WATER.

R. V. Mills, petroleum technologist, has studied the occurrence and relations of gas, oil, and water in different fields and their movement and rearrangement in the pay sands consequent on oil and gas extraction. The modes and causes of injury to pay sands and the consequent losses of oil through infiltrating waters have been studied with a view to developing methods of preventing or remedying these losses.

OIL-WELL DRILLING.

In some fields in California and elsewhere much trouble has been experienced in shutting off water from the wells because of the corrosion of well casings and the improper setting of cements. An investigation is being carried on by Mr. Mills with a view to enabling operators to cement off water and protect well casings against corrosion by using certain chemicals either with or without Portland cement.

The circulator method of drilling oil wells has been investigated by F. B. Tough, petroleum technologist, who is preparing a bulletin on the subject. The bulletin will point out the advantages of this method of drilling.

Mr. Tough acted in a consulting capacity with the State officials of Wyoming regarding a proposed law governing the drilling of oil wells within that State. Particular attention was given to the protection of the oil fields against infiltrating waters. Subsequent to this work, Mr. Tough and B. H. Scott made a detailed study of the operating conditions in the Salt Creek Field, Wyoming. Later the

Midwest Refining Co. and Ohio Oil Co. set aside $30,000 to be spent under the direction of the Bureau of Mines for supervision of drilling and repair work on oil wells in the Wyoming fields.

A bulletin, Methods of Shutting Off Water in Oil and Gas Wells, by Mr. Tough, was published during the year.

E. W. Wagy, petroleum engineer, acted as consulting engineer for the United States Land Office in the matter of supervision of water control at oil wells being drilled on public lands.

A bulletin entitled Bibliography of Petroleum and Allied Substances, 1916, by Miss E. H. Burroughs, editorial assistant, was issued during the year. A bulletin covering the literature for 1917 is being printed and one for 1918 is now being prepared for early publication. It is the intention of the bureau to issue these bibliographies annually.

OIL-WELL PRODUCTION.

C. H. Beal, petroleum technologist, worked on the average-decline curve method of estimating future production, which formed the basis of a scientific method used by the Internal Revenue Bureau of the Treasury Department for equitably taxing oil properties. Mr. Lewis directed the work of several engineers in the Mid-Continent fields collecting data and preparing curves, while Mr. Beal directed similar work in California. Bulletin 177, The Decline and Ultimate Production of Oil Wells, with Notes on the Valuation of Oil Properties, by C. H. Beal, has been of great help in this work. Mr. Beal has recently been conducting an investigation of methods for the valuation of oil lands.

A. W. Ambrose, petroleum technologist, H. H. Hill, chemical engineer, and J. P. Smootz, assistant petroleum chemist, worked on a report for the Treasury Department which served as a basis for the depreciation of equipment in connection with the production, refining, and marketing of petroleum and natural gas. This report covered an estimate of the life of various equipment of drilling and producing wells, pipe lines, tank cars, refineries, marketing facilities, buildings, and marine transportation.

The operators in the El Dorado-Augusta fields, Kans., met at the suggestion of Mr. Lewis for the purpose of organizing to combat the serious water problem there. From these meetings the Kansas Oil and Gas Association was formed. Considerable work was done in the fields on the water problem and on cementing wells by M. A. La Velle and Thomas Curtin, expert drillers, and J. O. Lewis.

An investigation of oil-casing perforations and screen pipe has been conducted by Mr. Wagy.

Cooperative work with the State Geological Survey of Illinois was conducted in the Illinois field. The purpose of this work was to

correct water problems as well as to demonstrate to the operators the benefit of subsurface studies in detecting the source of the waters. Mr. Tough started the bureau's activities in this work, and was later succeeded by Mr. Wagy.

The petroleum technologists and expert drillers of the Bureau of Mines carried on cooperative work with the Office of Indian Affairs at Muskogee, Okla. The work in Oklahoma has been largely educational, showing operators the value of cement in excluding waters from the productive oil zones. This work was under the direction of V. L. Conoghan, chief oil and gas inspector, and A. A. Hammer, oil and gas inspector, assisted by B. H. Scott, F. B. Reusch, and M. A. La Velle, expert drillers. Many diagrams showing apparatus and methods pertaining to more efficient methods of drilling and operating oil wells were distributed among operators.

Mr. Curtin, who assisted operators in shutting off water from oil and gas sands in Oklahoma and southern Kansas, has completed the manuscript on a paper entitled "Casing Troubles and Fishing Methods" which will be issued by the Bureau of Mines.

In cooperation with the Colorado State inspector of oils, the Bureau of Mines investigated conditions in the Boulder oil fields of Colorado with regard to attempting to recover some of the production of this field. This investigation was made by Mr. Wagy.

The petroleum division aided in determining the helium content of gas from different fields in the United States. Mr. Lewis cooperated with G. S. Rogers, of the United States Geological Survey, in the Mid-Continent districts. Mr. Ambrose made a study of the gases in Montana, North Dakota, Washington, and in the Bow Island field, Canada, and Mr. Ambrose and Mr. Wagy studied the California fields.

Mr. Ambrose is preparing a paper entitled "A Study of Underground Oil Field Conditions and Their Application to Water Problems," which points out methods for detecting the source of infiltrating waters and means for avoiding water troubles.

T. E. Swigart, assistant technologist in oil and gas production, carried on a series of investigations of the various drilling and producing problems of some of the larger oil companies of California. He also began work in the Comanche field, Okla., with a view to helping to solve the drilling and producing problems there.

REFINERY STATISTICS.

The petroleum division has collected statistics during the past fiscal year showing the output of the refined products from the refineries, such as gasoline, kerosene, lubricants, fuel oil, and miscellaneous oils. These statistics also included the amount of crude oil

run to the stills. The figures served to keep the United States Fuel Administration and other Government agencies advised at all times as to the actual production, stocks, and consumption of petroleum products. These data were published monthly and mailed to all refining companies and others interested. This work was under the direction of H. F. Mason, petroleum economist.

ENGINEERING TECHNOLOGY.

OIL STORAGE AND TRANSPORTATION LOSSES.

Enormous quantities of the most valuable constituents of petroleum are lost by evaporation during the storage of the crude oil.

A. R. Elliott, assistant engineer, under the direction of C. P. Bowie, petroleum technologist, has been obtaining data in California relative to evaporation losses of oil between the oil well and the refinery. J. H. Wiggins, assistant engineer, has started similar work in the Mid-Continent fields. The purpose of this investigation is to determine as nearly as possible what these losses are and to recommend practicable changes in transportation systems so as to reduce or eliminate losses.

REPORT ON TOPPING PLANTS.

J. M. Wadsworth, who had made particular study of the so-called "topping" or "skimming" plants in California, described the methods of constructing and operating representative types of plants in a bulletin entitled "Removal of the Lighter Hydrocarbons from Petroleum by Continuous Distillation."

OIL-CAMP SANITATION.

Mr. Bowie has prepared a report suggesting much needed improvements in the disposal of sewage, garbage, kitchen refuse, etc., at oil camps and pumping stations.

ECONOMY IN USE OF FUEL OIL.

Various problems of oil-fuel economies were investigated for the western division of the Fuel Administration. A number of fuel-saving devices were examined, such as burners, carburetor attachments, gages for small oil tanks, and gas radiators. Twenty-five boiler plants about San Francisco Bay, and 226 power plants in California using fuel oil were inspected and recommendations made that effected a saving of 5 to 25 per cent at each plant. Demonstrations were given at San Francisco of the use of powdered coal as a substitute for oil fuel. This work was done by Messrs. Bowie and Wagy, who acted as technical advisers of the western division of the

Fuel Administration, and by Mr. Wadsworth, who served as State administrative engineer for the California Fuel Administration.

A handbook entitled "Efficiency in the Use of Oil Fuel," by Mr. Wadsworth, was published for the use of boiler plant and locomotive engineers intimately associated with the use of fuel oil. A revised edition is in press.

EXTINGUISHING AND PREVENTING OIL AND GAS FIRES.

A bulletin by Mr. Bowie on methods of extinguishing oil and gas fires was issued early in the year.

MISCELLANEOUS.

Mr. Bowie acted as consulting engineer to the Bureau of Yards and Docks, of the Navy Department, in the matter of constructing and operating fuel-oil storage facilities at various Pacific coast points.

A study of transportation and utilization of heavy oils is being made by Mr. Bowie and M. J. Gavin, assistant refinery engineer. At present there are in California, Texas, and other parts of the United States, as well as Mexico, enormous quantities of heavy asphalt-base oil, ranging in gravity from 7° to 14° B. This oil is found chiefly in shallow wells and could be successfully produced if a commercial method were devised for rendering the oil fluid enough to be transported and marketed. Through this investigation it may be possible for the bureau to suggest some means whereby these results can be accomplished.

NATURAL GAS.

ABSORPTION OF GASOLINE FROM RESIDUAL GAS.

Investigations by W. P. Dykema, petroleum engineer, and R. O. Neal, chemical engineer, have demonstrated the possibility of using absorption apparatus to increase the efficiency of compression plants for recovering gasoline from natural gas. A report covering the investigation and showing the saving of gasoline that may be effected is in course of publication.

ESTIMATES OF COST OF GAS FOR NAVAL ORDNANCE PLANT.

At the request of the Navy Department the Bureau of Mines estimated the cost of producing the gas for the armor-plate plant to be constructed at Charleston, W. Va.

GAS TRAPS.

A technical paper on traps for saving gas at oil wells, by W. R. Hamilton, points out means for preventing waste of natural gas.

CHEMICAL TECHNOLOGY.

All problems of a chemical nature are included in the branch of chemical technology, which is in charge of E. W. Dean, petroleum chemist, who has headquarters at the Pittsburgh experiment station. A few of the more important investigations are as follows:

SPECIFICATIONS FOR PETROLEUM PRODUCTS.

The petroleum division assisted several Government organizations in drawing up specifications for the purchase of various grades of motor fuel.

In August, 1918, an Executive order authorized the establishment of a committee on the standardization of specifications for petroleum products. The duties of this committee were to standardize specifications for all petroleum products used by Government departments, and to make suggestions on specifications for the allied Governments. Shortly after the organization of this committee a technical subcommittee was appointed to study existing specifications and to make recommendations to the general committee. The Bureau of Mines was represented on the general committee by C. H. Beal, and on the subcommittee by H. H. Hill.

OTHER INVESTIGATIONS AND REPORTS.

Work on the production of gasoline from heavier oils by the vapor-phase cracking reaction was conducted by E. W. Dean and W. A. Jacobs. The work showed the effect of temperature, pressure, rate, and nature of oil used upon the results of the cracking reaction. Experiments are limited to conditions favorable for gasoline production.

A comparison of motor fuels in supercompression motors—as the result of engine tests, flying tests, and tests in the Bureau of Standards altitude chamber—is to be given in a report in course of publication. Information for this report was obtained by Clarence Netzen, chemical engineer, J. P. Smootz, assistant chemical engineer, and C. F. Kettering.

In April, 1919, the petroleum division undertook to determine the character of the motor gasolines sold throughout the country. This information was needed in connection with the work of drawing up specifications for Government purchases of gasoline and for purposes of general information. About 800 samples, collected from all parts of the country, have been analyzed by the Washington and Pittsburgh laboratories, and the results tabulated and classified. This gasoline survey is the most comprehensive that has ever been made, more samples having been collected and in a shorter time than ever

before. The entire chemical force of the division was employed in this work.

Work is in progress on a bulletin on the analytical distillation of petroleum, being prepared by E. W. Dean and H. H. Hill. This bulletin will be in three parts—distillation of ordinary crude oils, distillation of emulsified oils, and distillation of high-boiling oils. A technical paper is being prepared by Mr. Dean, Mr. Hill, and N. A. C. Smith, assistant petroleum chemist, on that part of the work having particular reference to emulsified oils and high-boiling oils requiring vacuum.

In the latter part of July, 1918, a report was received in this country that some gasoline shipped in May, 1918, had given trouble in airplane engines in France, and that the loss of a number of planes had been attributed to its use. Details were arranged at a conference between Col. U. G. Lyons and H. H. Hill in New York, August 26, 1918. C. R. Bopp was assigned to the task and spent practically his entire time from August 25 to December 1, 1918, inspecting shipments of gasoline for service overseas. Mr. Bopp inspected shipments representing 8,000,000 gallons of motor gasoline, 2,600,000 gallons of export aviation gasoline, and 725,000 gallons of fighting gasoline. W. G. Hiatt inspected at Gulf ports 55,000 barrels of motor gasoline for the American Expeditionary Forces.

A technical paper by G. A. Burrell and A. W. Gauger, "Vitiation of Garage Air by Automobile Exhaust Gases," shows the dangers attending the running of automobile engines in garages.

OIL-SHALE TECHNOLOGY.

Oil shale technologic work was under the direction of W. E. Perdew, until his departure for Europe in July, 1918. The work from that time on was carried on by M. J. Gavin, assistant refinery engineer, W. D. Bonner, consulting chemist, E. L. Quinn, and T. B. Brighton, assistant research chemists. Mr. Perdew, while in Great Britain, thoroughly investigated the shale industry in Scotland.

The work during the first half of the year was devoted to a study of the general oil shale situation in the United States and to a compiling of all available data on the subject. The work of the second half of the year consisted mostly in carrying on retorting experiments on a rather large scale with different shales, analyses of different shales, and chemical and physical examination of the oils produced, and advising those contemplating engaging in the industry.

The main object of the work is to furnish as much assistance as possible to the potential industry, but the work has been limited by a shortage of funds.

A mimeographed paper, Notes on the Oil-Shale Industry with Special Reference to the Rocky Mountain District, was prepared

by Mr. Gavin, Mr. Hill, and Mr. Perdew, and an extensive bibliography compiled by Mr. Gavin.

Dr. D. T. Day, consulting chemist, cooperated with the Southern Pacific Co. in the erection of a unit of Scotch-type retorts at Elko, Nev.

WAR MINERALS INVESTIGATIONS.

GENERAL STATEMENT.

The term "war minerals" has been applied to those ores and minerals, largely imported before the war, that were especially needed in the manufacture of military supplies. Among the more important are manganese, essential for making high-grade steel; graphite, for making crucibles; tin for tinplate and bearing metal; mercury, used as fulminate; potash, for making fertilizers and explosives; tungsten and molybdenum, for high-speed tool steel; antimony, for hardening bullet lead; chromite, for tool steel, for tanning leather, and as a refractory lining for furnaces; magnesite, for refractory linings; mica, as insulating material; platinum, for the manufacture of sulphuric acid and for electrical apparatus.

SPECIAL APPROPRIATION.

In the latter part of March, 1918, Congress in the urgent deficiency bill appropriated $150,000, to be expended under the Bureau of Mines, to extend and continue investigations relating to minerals of military importance. The general purpose of this work is indicated by the heading under which the appropriation was made:

War materials investigation.—For inquiries and scientific and technologic investigations concerning the mining, preparation, treatment, and utilization of ores and other mineral substances which are particularly needed for carrying on the war, in connection with military and manufacturing purposes, and which have heretofore been largely imported, with a view to developing domestic sources of supply and substitutes for such ores and mineral products as are particularly needed, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries.

This appropriation permitted organization and work on a much more extensive scale, although a large amount of war minerals work had already been undertaken by the Bureau of Mines.

The so-called war-minerals bill submitted to Congress in December, 1917, was passed by the House on April 30, and in modified form by the Senate on September 11, 1918. It was approved by the President on October 5, 1918. By Executive order of November 11, 1918, the administration of the act was delegated to the Secretary of the Interior. On that date the armistice ended hostilities. As the act primarily provided for insuring production for war purposes, it was not a reconstruction measure and further legislation was required for that purpose.

COOPERATION WITH MINING EXPERIMENT STATIONS.

The work of the war minerals investigations was closely associated with the work done at the mining experiment stations of the bureau under the direction of the division chiefs of the bureau and the supervisor of experiment stations. The Minneapolis, Minn., station worked entirely on problems related to manganese and its ores; the Columbus, Ohio, station took up special investigations of domestic clays, graphite, and refractories; the Urbana, Ill., station worked at the recovery and use of pyrite from coal mines; the Golden, Colo., station studied the recovery of potash, tungsten, radioactive metals, and other rare metals; the Tucson, Ariz., station made field investigations of manganese ores; the Salt Lake City, Utah, station investigated graphite milling; the Berkeley, Calif., station gave attention to the concentration and recovery of quicksilver and sulphur; the Seattle, Wash., station made concentration tests of chromite and of tin ore.

MANGANESE.

Early in the fiscal year W. R. Crane completed an investigation of the Georgia deposits in cooperation with the State geological survey; E. R. Eaton studied the improvement of mining and beneficiation methods in the South; C. E. van Barneveld, superintendent of the Tucson station, investigated many of the western deposits; G. D. Louderback began an examination of the California deposits in cooperation with the United States Geological Survey and State organizations; G. H. Clevenger was studying the recovery of manganese from the ores of the Cripple Creek district; and the Minneapolis station was working on new metallurgical processes. After the signing of the armistice the bureau's activities were directed chiefly toward enabling producers to face the sudden lessening of demand. W. C. Phalen was engaged the larger part of the year on manganese investigations and assisted in the conduct of the work. C. M. Weld had general charge of the work on manganese.

The manganese investigations showed that in time of war a large part of the manganese needed in this country could be obtained from domestic ores, reductions in imports being met by the development of new deposits of high-grade ore, by the beneficiation of low-grade ores, and by the use of low-manganese alloys made from these leaner ores. A comprehensive bulletin on manganese, its utilization, treatment of its ores, and mining costs is in press.

CHROMITE AND CHROMIUM.

A thorough investigation of the chromite deposits of California and Oregon made under the direction of Albert Burch with the

assistance of five field engineers, the samples collected being subjected to concentration tests at the Seattle and Berkeley stations.

Investigations of substitutes for chrome brick, began at the Columbus station in the previous fiscal year, were continued.

PYRITE.

R. R. Hornor and C. E. Julihn investigated deposits in various States. Work on the possible recovery of sulphur from "coal brasses" was completed. This work was undertaken in cooperation with the State geological surveys of Pennsylvania, Virginia, Ohio, Kentucky, Tennessee, Indiana, Illinois, Michigan, Missouri, and Iowa.

SULPHUR.

Sulphur deposits in the West were studied with regard to their availability as sources of supply, C. O. Lindberg making the field investigations, and J. M. Hyde the concentration tests at the Berkeley station.

SULPHURIC ACID.

A. E. Wells, acting in cooperation with the War Industries Board and continuing work of the previous year, made a thorough study of the production of sulphuric acid and collected a great mass of data regarding materials, methods, and costs. Much of this information will appear in a bulletin now being prepared.

PLATINUM.

Up to the time of the signing of the armistice the Bureau of Mines cooperated with the War Industries Board in measures to reserve a supply of platinum adequate for war needs, the bureau having been given authority by Congress to control the production and sale of platinum during the war.

ARSENIC.

In October, 1918, the War Department put in a heavy requirement for arsenic, and steps were taken immediately to meet the demand. A. E. Wells and H. S. Mudd examined several prospective sources of arsenic in the eastern States, and producers in the West were encouraged to plan increasing their output. However, at the signing of the armistice the War Department's requirements were canceled, and before extra expenditures were incurred, all the new projects for increasing arsenic production were discontinued, except a new plant at Anaconda, Mont., at which the arsenic is merely a by-product.

GRAPHITE.

The graphite investigations, in charge of G. D. Dub, included field examinations and visits to plants using graphite, to ascertain the quality needed for making satisfactory crucibles. On August 10, 1918, the War Industries Board requested that all crucible makers use 20 per cent domestic flake in their crucible mixtures for the balance of 1918 with an increase to 25 per cent in 1919. This action, which was taken on the recommendation of the Bureau of Mines, resulted in the establishment of a market for domestic flake graphite. Tests of samples sent to the Salt Lake City station resulted in the devising of better milling methods. An investigation of the merits of domestic graphite for making crucibles continued at the Columbus station. A comprehensive bulletin on crucible graphite is in press.

POTASH.

A. W. Stockett continued to collect data on sources of potash, its recovery from the dust of cement kilns and blast furnaces, from green sands, from the alunite deposits of Utah, and from the natural brines of Searles Lake, Calif., and the Nebraska lakes. G. H. Clevenger continued cooperative work at Colorado Springs on the recovery of potash and manganese from western ores.

QUICKSILVER.

The Berkeley station studied the metallurgy of the ores of mercury. At the Seattle station concentration tests of low-grade ores were made.

TIN.

The work on tin was confined chiefly to the utilization of Bolivian tin ores. Howland Bancroft and Charles Janin prepared a report on the subject.

TUNGSTEN, MOLYBDENUM, URANIUM.

The work on tungsten and other rare metals under the direction of H. C. Morris consisted chiefly in the collection of data relating to mining and milling methods, companies producing, and prospective sources of supply. R. W. Gannett assisted in this work.

IRON.

In addition to gathering data regarding needs, production, and sources of supply of iron, F. T. Eddingfield examined the magnesite deposits of the Adirondack region, New York, and studied methods

of milling the ores and the blast furnace practice. F. E. Wormser examined the iron-ore fields of Alabama.

LEAD AND ZINC.

Various deposits of lead and zinc ores were examined by W. E. Henry and F. B. Hyder.

ACCOUNTING METHODS FOR SMALL METAL MINES.

To aid operators of small mines to obtain the economies practicable through careful accounting, a technical paper on "Cost Keeping for Small Metal Mines," by J. C. Pickering, was published during the year.

MISCELLANEOUS WORK.

Various investigations conducted through the several mining experiment stations of the bureau have been mentioned above, and more detail regarding some of these investigations will be found in the accounts of the work of the stations (pp. 725 to 765). C. M. Weld and J. C. Pickering, of the war minerals investigations, made field trips and conferred with the supervisor of stations in order to insure coordination of effort.

In addition to the various special investigations mentioned, exhibits of various metals showing their ores and their uses in war and commerce were prepared. A mimeographed circular containing excerpts from the progress reports of the war minerals investigations was issued monthly for the use of Government officials and the information of the public.

All mineral specimens sent to the Washington office for identification were examined and the senders notified as to mineral content and probable value. About 2,000 specimens were examined during the year, chiefly by Oliver Bowles.

PUBLICATIONS.

A series of mimeographed reports, 18 in all, covering aluminum, graphite, manganese, sulphur, and other war minerals was prepared and distributed to Government officials and the industries directly concerned. The editing of these reports was in charge of C. T. Robertson.

A list of the publications follows:

1. Labor saving in limestone quarrying, by O. Bowles.
2. The potash situation, by A. W. Stockett.
3. Preparation of crucible graphite, by G. D. Dub.
4. Note on the national importance of allocating low-ash coke to the manganese-alloy furnaces, by P. H. Royster.

5. Production of ferromanganese in blast furnaces, by P. H. Royster.
6. Production of spiegeleisen in blast furnaces, by P. H. Royster.
7. Review of the manganese situation, by C. M. Weld.
8. Refining Alabama flake graphite for crucible use, by F. G. Moses.
9. Problems involved in the concentration and utilization of domestic low-grade manganese ore, by E. Newton.
10. Electric smelting of domestic manganese ores, by H. W. Gillett and C. E. Williams.
11. The use of manganese alloys in open-hearth steel practice, by S. L. Hoyt.
12. The Jones process for concentrating manganese ores, by Peter Christianson and W. H. Hunter.
13. Cost of producing ferrograde manganese ores, by C. M. Weld and W. R. Crane.
14. Special and commercial light aluminum alloys, by Robert J. Anderson.
15. Concentration of native sulphur ores by flotation, by James M. Hyde.
16. Uses of manganese other than for steel making, by W. C. Phalen.
17. Preparation of manganese ore, by W. R. Crane.
18. Zinc industry in Belgium, by March F. Chase.

EXPLOSIVES DIVISION.

GENERAL STATEMENT.

From July 18, 1918, Clarence Hall had charge, as chief explosives engineer, of the explosives division, with headquarters in Washington. Previously the explosives division was under the direction of F. S. Peabody, assistant to the director, in charge of explosives. The duties of this division comprised (1) administration and questions of policy; (2) investigations of licensees and issuing of manufacturers, exporters, and importers licenses; (3) examination and appointment of field employees; (4) investigation and prosecution of violations of the act; (5) proper storage of explosives or ingredients.

The purpose of the explosives-regulation act, approved October, 1917 (40 Stat., 385), is set forth as follows:

> That when the United States is at war it shall be unlawful to manufacture, distribute, store, use, or possess powder, explosives, blasting supplies, or ingredients thereof, in such manner as to be detrimental to the public safety, except as in this act provided.

One of the primary objects of the act was to prevent explosives from getting into the hands of persons hostile to the United States Government. An essential provision was the requirement of licenses, no person being permitted to manufacture or possess explosives or their ingredients without holding a license. More than 1,000,000 of these licenses were issued.

The administration of the act was delegated to the Director of the Bureau of Mines, as this bureau, through its work on mine explosives, was best equipped for the purpose.

The administrative duties included supervision of the several State inspectors, appointed by the President, and of the licensing agents

appointed by the Director of the Bureau of Mines. The field force, including the licensing agents, numbered more than 14,000 men, but the active force required at the Washington office numbered not more than 50 persons.

The explosives division continued vigorous efforts to stop careless practice in the use of explosives; examined magazines throughout the country, and took measures to stop storage of explosives under conditions that constituted a menace to life and property; made special investigations of refusals or revocations of licenses, of violations of the act, and of outrages against life and property; and sought to have offenders against the act punished.

Because of the signing of the armistice some of the commodities listed as requiring license were exempted on November 14, 1918, as no longer coming under the law except under certain special circumstances. This modification applied to ingredients not used or intended to be used in the manufacture of explosives and to fireworks. On January 9, 1919, regulations relating to ammonium nitrate, electric blasting machines, and flashlight powders were revoked. On March 15, 1919, regulations on the possession, sale, and use of explosives for agricultural purposes, were removed, except for subjects of enemy countries.

REGULATION OF PLATINUM AND ALLIED METALS.

Platinum being essential to the manufacture of explosives and the supply having become inadequate through the collapse of the Russian Government and the rapidly increasing demand for the metal, both the War Department and the War Industries Board appreciated the necessity of licensing the users of platinum so that proper control over the metal could be maintained. Accordingly, Congress, by the act of October 6, 1917 (40 Stat., 385), amended by the act of July 1, 1918 (Public, 181), authorized the Director of the Bureau of Mines, under rules and regulations approved by the Secretary of the Interior, to limit, during the period of the war, the sale, possession, and use of platinum, palladium, and iridium and compounds thereof.

On account of the signing of the armistice the restrictions this act placed on the manufacture, possession, purchase, sale, and use of platinum and allied metals were removed by the Director of the Bureau of Mines, with the approval of the Secretary of the Interior, on November 14, 1918.

GOVERNMENT FUEL YARDS.

During the coal shortage of the winter of 1917–18, the advantages of centralizing the purchase and distribution of the coal needed by the Government buildings in the District of Columbia, advantages

that had been pointed out repeatedly by the Bureau of Mines, were recognized by Congress and that body made provision for the establishment of a Government fuel yard in the District. Among the appropriations made for the Bureau of Mines by the sundry civil act approved July 1, 1918 (Public, No. 181, 65th Cong.), are the following:

Government fuel yards: The Secretary of the Interior is authorized and directed to establish in the District of Columbia storage and distributing yards for the storage of fuel for the use of and delivery to all branches of the Federal service and the municipal government in the District of Columbia and such parts thereof as may be situated immediately without the District of Columbia and economically can be supplied therefrom, and to select, purchase, contract for, and distribute all fuel required by the said services. Authority is granted the Secretary of the Interior, in connection with the establishment of the said yards, to procure by purchase, requisition for immediate use, condemnation, or lease for such period as may be necessary, land, wharves, and railroad trestles and sidings requisite therefor. All branches of the Federal service and the municipal government in the District of Columbia from and after the establishment of the said fuel yards, shall purchase all fuel from the Secretary of the Interior and make payment therefor from applicable appropriations at the actual cost thereof to the United States, including all expenses connected therewith.

For the establishment of the fuel storage and distributing yards herein authorized, including the procurement of the necessary land, wharves, railroad sidings, and trestles; storing, handling, and distributing equipment, including motor-propelled passenger-carrying vehicles for inspectors; and all other expenses requisite for and incident thereto, including personal services in the District of Columbia; $432,300, to be available immediately.

For the purchase and transportation of fuel; storing and handling fuel in yards; maintenance and operation of yards and equipment, including motor-propelled passenger-carrying vehicles for inspectors, rentals, and all other expenses requisite for and incident thereto, including personal services in the District of Columbia, $1,154,088, to be available immediately: *Provided*, That all moneys received from the purchase of fuel during the fiscal year nineteen hundred and nineteen shall be credited to this appropriation and be available for the purposes of this paragraph: *Provided further*, That no part of any moneys herein or hereafter appropriated shall be used for the purpose of taking over or in any way interfering with the yards or coal dumps or other facilities for storage and distribution of coal that have been used and occupied in the past year by coal dealers for supplying the general public.

Four-fifths of the two preceding sums shall be paid out of the Treasury of the United States and the other one-fifth out of the revenues of the District of Columbia.

During the year a storage yard was built, equipped and put in operation at Half and I Streets SE. The yard is equipped with hoppers, bins and belt conveyors for unloading coal cars, storing the coal, and loading it into trucks. This equipment has an unloading capacity from cars of 300 tons an hour, an unloading capacity from the two 600-ton bins into trucks of 1,200 to 2,000 tons daily, and a total storage capacity of 20,000 tons. The approximate cost of the yard and its equipment was $260,000.

For distributing the coal to the various buildings in the district a fleet of 33 motor trucks was purchased, 13 of these being 7½-ton, 15 being 5½-ton, and the others smaller. The approximate cost of these trucks and the garage in which they are housed was $170,000.

In the fiscal year 247,540 tons of fuel was purchased, of which 232,049 tons was bituminous coal and 15,491 anthracite; of this tonnage 165,669 tons was hauled by trucks to Federal and municipal institutions within or contiguous to the District of Columbia; and 71,725 tons was delivered direct in car-load lots.

Lauson Stone, chief engineer, was in charge of the fuel yard until he resigned from Government service on May 1, 1919. His successor as chief engineer, George S. Pope, took charge May 1, 1919.

WORK OF THE MINING EXPERIMENT STATIONS.

BARTLESVILLE STATION.

During the first half of the fiscal year 1919, the staff of the petroleum experiment station at Bartlesville, Okla., gave attention to the erection of two brick buildings for the station, these consisting of an administration building, 38 feet by 60 feet, of two stories and a basement, and a laboratory building. Approximately $20,000 was spent in laboratory, shop, and office equipment.

GASOLINE FROM NATURAL GAS.

Early in the year, W. P. Dykema, petroleum technologist, and R. O. Neal, chemical engineer, undertook to determine the approximate amount of gasoline wasted through inefficient methods in the compression process of recovering gasoline from natural gas. Representative tests of the residual gas from plants in various parts of the Mid-Continent field, a special absorption tester designed by Mr. Dykema being used, showed an average loss of approximately one-half gallon of gasoline for each thousand feet of gas treated by the compression method. In one plant, where corrective methods recommended by the bureau were adopted, the output of gasoline was increased about 400 gallons a day, at a cost to the company of only about $800. The small absorption tester used in this investigation is now being made by various manufacturing concerns and also made for private use by individual producing companies.

UNDERGROUND WATER PROBLEMS IN KANSAS.

A campaign for the alleviation of the menace from underground water in Butler County, Kans., was undertaken early in 1919, and conducted under the direction of J. O. Lewis. Demonstrations of the use of cement in shutting off water in wells were given, and other educational work carried on. Other demonstrations in the use of cement in shutting off water from oil wells were given in Oklahoma, Texas, and Illinois.

FUTURE PRODUCTION OF OIL PROPERTIES IN MID-CONTINENT FIELD.

Under the direction of Mr. Lewis a number of engineers collected data and prepared curves for estimating the future production of oil properties in the Mid-Continent field. This work was part of an investigation described in more detail on page 710.

DISTRIBUTION OF NATURAL GAS TO ARKANSAS CITIES.

At the request of the United States Fuel Administration the properties of the American Natural Gas Co., serving the cities of Little Rock, Hot Springs, and Pine Bluff, Ark., were examined from the wells to the consumer, and a report, which was published by the Fuel Administration, was made by Mr. Dykema, H. R. Pierce, assistant natural gas engineer, and E. W. Wagy, petroleum technologist, of the Bureau of Mines. The purpose of the investigation was to determine whether anything could be done to overcome the shortage of natural gas in Little Rock.

MANUFACTURE OF CARBON BLACK.

In February, 1919, R. O. Neal began a study of the manufacture of carbon black and the waste of natural gas therein, various corporations commissions and public utilities commissions in different States where carbon black is manufactured having started investigations as to the advisability of prohibiting the use of natural gas for the purpose, on the ground that such use is a waste of resources. G. St. J. Perrott, physical chemist, of the Pittsburgh station, who is cooperating with Mr. Neal, conducted laboratory experiments at that station on methods of producing and testing carbon black, as mentioned on page 751. The results of this investigation, which will include the possible development of more efficient methods of manufacture, will be published by the bureau.

POSSIBLE IMPAIRMENT OF NATURAL GAS BY GASOLINE RECOVERY.

Mr. Neal and D. B. Dow, assistant petroleum chemist, are determining the loss of heating value in gas through the recovery of the gasoline content by the absorption method. In several of the gas-producing States it has been claimed that the removal of the gasoline vapors lowers the heating value of the gas materially, so that users of the gas distributed by the large gas companies get an inferior fuel. The results of this investigation will be published by the bureau.

AIRPLANE FUELS.

Clarence Netzen, chemical engineer, up to the time of his death, on December 11, 1918, spent practically all of his time on work for the War Department on the development of aeroplane fuel. Mr. Netzen did valuable work on this problem, and his death was a severe loss to the bureau and the industry.

EVAPORATION LOSSES IN OIL STORAGE.

J. H. Wiggin, assistant engineer of the Bartlesville station, working in connection with C. P. Bowie, of the San Francisco office, and in

cooperation with the Empire Gas & Fuel Co., is endeavoring to ascertain how storage methods may be improved and loss of hydrocarbons by evaporation prevented. Tests are being made at the storage tanks of the Empire Gas & Fuel Co. under actual working conditions.

VALUATION OF NATURAL GAS.

Mr. Dykema, petroleum engineer, and H. R. Pierce, assistant natural gas engineer, are conducting an investigation to determine the value of natural gas to consumers. Little work by any governmental agency has been done on this important subject and millions of cubic feet of gas have been wasted yearly through lack of appreciation of its value. The present investigation grew out of differences between lessees and lessors of gas lands in the Osage Indian Reservation, the value of the gas there being in dispute. That part of the report covering the Osage Nation will be completed early in the fiscal year 1920, but the investigation will be continued to cover other districts than the Osage, and a final report published.

POSSIBLE IMPROVEMENTS IN REFINERY PRACTICE.

H. H. Hill, chemical engineer, is erecting a miniature refinery, consisting of one 5-barrel still and three 1-barrel stills, at the Bartlesville station. With these stills experiments in refining different crudes will be made in the endeavor to recover more of the higher-priced products.

DEHYDRATION OF EMULSIFIED OIL.

One of the greatest losses in the petroleum industry is caused by the failure of producers and refiners to treat the emulsified oil from storage tanks. In the hope of discovering some commercially feasible means of separating the oil and water, the dehydration problem is being investigated by Mr. Neal.

BERKELEY STATION.

WAR MINERALS INVESTIGATIONS.

A number of war minerals investigations were completed before the signing of the armistice; others, though incomplete, were discontinued then. The Berkeley mining experiment station cooperated with Albert Burch, who directed the survey of chromite deposits in the West, and with Prof. G. D. Louderback, chairman of the committee on mineral resources of the State Council of Defense for California, who had charge of the survey of manganese ore deposits in California for the Bureau of Mines and of both manganese and chromium ore deposits for the United States Geological Survey. In addition to the study of various metallurgical problems related to

the war minerals, some 2,500 determinations of samples of war minerals were made from July to November, 1918.

In January, 1919, L. H. Duschak, superintendent of the station, went to Washington to act as chief metallurgist for the bureau during the absence of F. G. Cottrell. As a result, work was curtailed during the early months of 1919.

METALLURGY OF MERCURY.

Various problems related to the treatment of quicksilver ores were studied during the year. Some of the work was done in cooperation with the New Idria Quicksilver Mining Co., Oceanic Quicksilver mine, Oat Hill Quicksilver Mining Co., and the St. Johns Mines Co.

FUME LOSSES IN QUICKSILVER CONDENSATION.

L. H. Duschak, chemical engineer in charge, assisted by C. N. Schuette, junior chemist, completed in July work on quicksilver fume began in the previous year. They established the fact that loss of metal as fume is ordinarily very small. A report of this work was published in a technical paper of the Bureau of Mines.

QUICKSILVER CONDENSATION FROM FURNACE GASES.

Messrs. Duschak and Schuette developed a type of condenser that is more quickly built than those in current use and can be cleaned with minimum danger to the men employed. A full-sized unit, constructed by the management of the Oat Hill mine for use in conjunction with a 40-ton Scott furnace, began work January, 1919, and has been in continuous operation since.

ROASTING OF QUICKSILVER ORES.

Mr. Duschak, assisted by C. M. Bouton, assistant physical chemist, completed in March, 1919, an investigation, begun the year before, which provided data not previously available in regard to the time and temperature necessary to eliminate quicksilver from different kinds and sizes of ore. A report is in preparation.

QUICKSILVER ASSAYING.

Work on quicksilver assaying, completed in the fall of 1918 by Mr. Duschak, W. C. Riddell, chemical engineer, and Mr. Bouton, developed an improved method for the determination of mercury in all kinds of ore, furnace products and mercurial materials, including those containing large quantities of sulphur and organic matter. The method is quicker and more accurate than methods

previously in vogue. A report on the subject was submitted for publication.

QUICKSILVER PRACTICE IN TEXAS.

The method of treating quicksilver ore in the Terlingua district of Texas, which differs in some respects from the practice in California and Nevada, was investigated by Messrs. Duschak and Schuette.

HEALTH AND SAFETY CONDITIONS IN THE QUICKSILVER INDUSTRY.

Mr. Duschak and H. M. Wolflin, mining engineer, in cooperation with the Industrial Accidents Commission of California, studied the factors bearing on the health and safety of workers, particularly furnace men, in the quicksilver industry. As a result, health and safety regulations were prepared for promulgation by the Industrial Accidents Commission.

CHROME AND MANGANESE.

Mr. Duschak, assisted by W. C. Riddell, chemical engineer, Esther Kittredge, junior chemist, and Edwin H. Delius, laboratory assistant, investigated chrome and manganese in cooperation with members of the war minerals investigation, studying methods of concentration employed in California and the smelting practice at two electrometallurgical plants in the State. With the assistance of Prof. E. A. Hersam, of the University of California, small-scale concentration tests were made on a number of lots of both manganese and chrome ore.

Two articles were published in the technical press.[a]

MANUFACTURE OF CARBON ELECTRODES.

In cooperation with G. H. Clevenger at Colorado Springs, with the Pacific Electro Metals Co., Bay Point, Calif., and the Iron Mountain Alloy Co. of Utah Junction, Colo., an investigation was begun in July, 1918, to determine the best method of manufacturing the large-sized electrodes used in electric furnaces. Small-scale experiments were made at Berkeley and large-scale experiments, involving the manufacture of 24-inch electrodes, at the plant of the Pacific Electro Metals Co. The investigation was in charge of Mr. Duschak, aided by W. H. Rodebush, assistant chemical engineer.

[a] Riddell, W. C., and Kittredge, Esther, Determination of chromic oxide in chromite: Min. and Sci. Press, vol. 117, Oct. 26, 1918, p. 558; Riddell, W. C., The determination of manganese, a modification of Volhard's method: Min. and Sci. Press, vol. 118, April 19, 1919, p. 537.

CONCENTRATION OF SULPHUR BY FLOTATION.

Mr. Duschak, assisted by J. M. Hyde, consulting mining engineer, and Hiller Zobel, junior chemist, completed in October, 1918, an investigation that showed that nearly all low-grade sulphur ores were readily amenable to treatment by flotation and, in general, 70 per cent to 85 per cent recovery with production of an 80 per cent concentrate could be obtained. Prof. W. S. Morley of the University of California assisted in the latter stages of the work. The results of this investigation were published in the war minerals investigations series under the title "Concentration of Native Sulphur Ores by Flotation."

VOLATILITY OF METALLIC COMPOUNDS.

During the fiscal year the problems selected were chosen with the view of supplying the fundamental data needed by the Salt Lake City station in investigating the volatilization methods for complex ores, containing lead, zinc and silver.

A bibliography of the volatility of compounds of lead and zinc and another of methods of vapor-pressure determination were prepared by Messrs. Duschak and Eastman.

VAPOR PRESSURE OF LEAD AND OF SILVER CHLORIDE.

An investigation of the vapor pressure of lead chloride was started in July and completed in September, 1918. The vapor pressure of lead chloride from the boiling point (945° C.) down to 400° C. was determined with an accuracy of about 5 per cent, this work thus providing data not previously available. The data are given in a technical paper, now in press, by Messrs. Duschak and Eastman.

An investigation of the vapor pressure of silver chloride was started in April, 1919. By June 30, a series of determinations had been carried out at two temperatures by Messrs. Duschak and Eastman. Work is to be continued.

POTASH PRODUCTION AT SEARLES LAKE.

In the latter part of May, 1919, a systematic study was undertaken of the activities of the companies now busy at Searles Lake, data being collected as to the processes in use, the working costs, and contemplated improvements and economies. A full report is in preparation by Messrs. Duschak and Riddell.

ASSISTANCE AT THE ARGONAUT MINE FIRE.

W. C. Riddell, in cooperation with Mr. Wolflin, the bureau's district engineer, assisted the Argonaut mine, Jackson, Calif., to combat a

serious fire. Mr. Riddell spent in all about a month at the mine making gas analyses and thus facilitating the work of fire fighting.

PUBLICATIONS.

The published articles prepared at the Berkeley station during the fiscal year 1918–19 are as follows:

Notes on Quicksilver Metallurgy, by L. H. Duschak;[a] Fume and other Losses in Condensing Quicksilver from Furnace Gases, by L. H. Duschak and C. N. Schuette;[b] Determination of Chromic Oxide in Chromite, by W. C. Riddell and Esther Kittredge;[c] The Determination of Manganese: A Modification of Volhard's Method, by W. C. Riddell;[d] Concentration of Native Sulphur Ores by Flotation, by James M. Hyde;[e] The Vapor Pressure of Lead Chloride, by E. D. Eastman and L. H. Duschak;[f] The Determination of Mercury, by C. M. Bouton and L. H. Duschak.[g]

COOPERATION WITH THE UNIVERSITY OF CALIFORNIA.

During the fiscal year 1918 the bureau occupied space in the mining building of the University of California, under a cooperative arrangement. The university furnished laboratory, machine shop, and storeroom space, light, water, gas, janitor services, and some electric power without expense to the bureau. Two members of the metallurgical staff of the University, Profs. Hersam and Morley, cooperated with the bureau in war minerals investigations.

PERSONNEL.

The personnel of the station during the year included: L. H. Duschak, chemical engineer, and superintendent of station; W. C. Riddell, chemical engineer; James M. Hyde, consulting mining engineer; Worth H. Rodebush, assistant chemical engineer; E. D. Eastman, associate chemist; C. M. Bouton, assistant physical chemist; C. N. Schuette, Hiller Zobel, and Esther Kittredge, junior chemists.

COLUMBUS STATION.

GENERAL STATEMENT.

The Columbus station is conducted under the general form of agreement adopted by the bureau for cooperative work with State

[a] Included in California State Mining Bureau Bulletin No. 78, Quicksilver Resources of California. 1918.

[b] Published in Min. and Sci. Press, vol. 117, Sept. 7, 1918, pp. 315–323; also in Tech. Paper 96 of the Bureau of Mines.

[c] Published in Min. and Sci. Press, vol. 117, Oct. 26, 1918, p. 558.

[d] Published in Min. and Sci. Press, vol. 118, Apr. 19, 1919, p. 537.

[e] Published as Minerals Investigation Series No. 15, Bureau of Mines, 1919.

[f] Published as Tech. Paper 225, Bureau of Mines

[g] Being published as Tech. Paper 227, Bureau of Mines.

universities. The Ohio State University provides offices, laboratories, and general operating facilities such as water, light, fuel, compressed air, kilns, etc. All work of a general nature is under the exclusive direction of the Bureau of Mines; all work pertaining exclusively to the State of Ohio is conducted under the joint supervision of the Bureau of Mines and the Ohio State University.

The new quarters erected by the university for the station were not ready for occupancy until September, 1918. Since then, eight laboratories and three offices have been equipped and a large gas-fired laboratory kiln of the recuperative type has been added to the equipment.

Seven chief investigations engaged the attention of the station during the fiscal year, as follows:

1. Crucible-making properties of American graphites and bond clays as compared with imported materials.

2. Physical properties and pottery-making values of American white clays (kaolins and china clays) as compared with imported white clays now used in American ceramic industries.

3. Dolomite-magnesite. To develop, if possible, a suitable dolomite refractory as a substitute for the imported magnesite.

4. Cooperative work with the United States Geological Survey. By request of the United States Geological Survey samples of clays collected by its representatives in the field are being tested for physical properties and ceramic value.

5. Ceramic-equipment design, with a view to developing greater efficiency of apparatus and equipment used in ceramic industries.

6. Cooperative work with the Ohio Geological Survey in an investigation of the refractory fire clays of the State.

7. Spalling tests of fire brick.

CLAY AND GRAPHITE MIXTURES FOR CRUCIBLES.

The work to the end of the fiscal year consisted of laboratory tests of 21 bond-clay samples and 23 samples of graphite to determine how the physical properties of these materials when used in graphite crucibles compare with those of the best known imported graphites and bond clays. The domestic clays were compared with the German Klingenberg crucible clay which has been largely used in this country for making crucibles and has been considered a standard.

The laboratory examination indicated that clays from at least three districts in the United States, these clays being from firms at St. Louis, Mo., Enid, Miss., and Anna, Ill., were substantially equal to the Klingenberg clay. Others tested were deficient in only one or two physical properties and by blending two or more of these it is believed several satisfactory clay bonds may be developed.

Two hundred No. 70-size crucibles for brass melting and 100 No. 60-size for steel melting were made at the Vesuvius Crucible Co. plant at Swissvale, Pa., and will be tested to determine the comparative crucible-making properties of 20 bond clays, 18 being domestic, 1 English, and 1 German.

FUSIBILITY OF GRAPHITE ASH.

Tests were made of the fusibility of graphite ash and its influence on the refractoriness of bond clay. The graphites used in crucibles differ greatly in ash content. Crucible manufacturers usually specify a graphite carbon content of not less than 85 per cent, which means that a little less than 15 per cent ash is permissible, the ash having been regarded as an injurious flux.

To determine the fluxing effect of the ash, cones were made by mixing 12 parts of the ash with 88 parts of a standard bond clay, the approximate proportion which would exist in the average crucible after the carbon was burned out, and heated to deformation. The ash of 21 samples of graphite—from Alabama, Pennsylvania, New York, Canada, and Ceylon—was tested. The results showed that the ash from Alabama graphite is most refractory and that the tendency of a graphite ash to lower the refractoriness of a crucible is not enough to be injurious at brass-melting temperatures and would seldom be detrimental in steel melting.

CONVERSION OF ALABAMA FLAKE GRAPHITE TO THE GRANULAR FORM.

Ceylon graphite occurs in massive lumps that can be crushed and screened to almost any desired fineness, the product being granular or "splintery," whereas the Alabama and other graphites used in crucible manufacture occur in the form of thin, flat plates or flakes. As superior crucible-making properties have been claimed for Ceylon graphite because of its form of grains, Alabama flake graphite was converted to the granular form by mixing with tar, briquetting, coking, crushing, and screening.

Results of the average tests of 44 crucibles under brass-foundry practice indicated that such transformation of grain did not lengthen the life of the crucible, for crucibles containing flake graphite showed longer life than those made from the coked grain.

EFFECT OF ELECTROLYTES ON THE PROPERTIES OF GRAPHITE CRUCIBLE BODIES.

Addition of caustic soda and of hydrochloric acid to graphite crucible bodies containing Dorset bond clay and Mississippi bond clay were made to determine the effects of these two electrolytes on

the working properties, transverse strength, density, porosity, and shrinkage of bodies made with each clay.

NaOH added to slips containing Alabama flake graphite and Dorset clay, increased the viscosity but more alkali decreased it; with Ceylon graphite or Alabama coked graphite in place of Alabama flake graphite, increase in viscosity is not noticed; with Mississippi clay in place of Dorset clay, small percentages of NaOH decrease viscosity.

TESTS OF CRUCIBLES IN BRASS-FOUNDRY PRACTICE.

To obtain data for the War Industries Board and the Shipping Board, 144 crucibles containing Ceylon, Canadian, and Alabama graphites were tested under brass-foundry practice.

Results thus far show that the substitution of Canadian graphite up to 25 per cent for Ceylon, decreased the life of the crucible; substitution of Alabama flake graphite or coked Alabama graphite for Ceylon improved the life of the crucible. Substitution of coked Alabama graphite for Alabama flake up to 22.73 per cent increased and higher substitutions decreased the life of the crucible. Crucibles giving highest average service on mild brass were those containing all Ceylon graphite, whereas, those giving highest service on the severe brass contained only Alabama flake. Hence Alabama graphite offers promising possibilities for the manufacture of graphite crucibles.

WHITE CLAYS.

The principal deposits of white clay being mined east of the Mississippi River were inspected and sampled and a report prepared on the field work. Seventy-seven samples have been washed and molded into test pieces, and the water of plasticity, drying shrinkage, porosity, and specific gravity determined. Test pieces to determine pyro-physical properties, and pottery bodies for comparison with pottery made from imported clays have been prepared. Similar tests are being made of clays submitted by the United States Geological Survey.

DEAD-BURNING OF DOLOMITE.

Prior to the war more than 80 per cent of the magnesite used for refractory furnace lining came from Austria and Greece. Most of the magnesite refractories are used east of the Mississippi River, and normally the cost of mining, preparing, and transporting the magnesite from the great deposits in California and Washington was so great that the foreign magnesite could be obtained much more cheaply than the domestic. For the purpose of aiding the development of the dolomite deposits in the Eastern States, the Columbus

station undertook an investigation of methods of dead-burning dolomite and the properties of the resulting products. Samples of several Ohio dolomites were burned after mixing with coal tar, flue dust, iron ore, basic open-hearth slag, blast-furnace slag, Bedford shale, kaolin, roll scale, or calcium chloride, and the effect of each substance on the degree of burning of the dolomite and the resistance to slaking of the product. Roll scale seemed most effective in dead-burning dolomite without unduly decreasing the refractoriness.

A large percentage of iron oxide (20 to 30 per cent with 80 to 70 per cent dolomite) may be used without unduly decreasing the refractoriness of the product. Siliceous impurities like kaolin decrease refractoriness much more.

Dolomite mixed with tar, packed in graphite, and burned at a high temperature becomes very resistant to slaking; not packed in graphite during the burning, it slakes easily. Dolomite mixed with 10 per cent calcium chloride and burned becomes surprisingly resistant to slaking.

CERAMIC EQUIPMENT DESIGN.

As much of the equipment used in investigating ceramic raw materials must be designed to suit the investigation, the following equipment has been constructed at the Columbus station: Down-draft recuperative gas-fired test kiln, with setting chamber 39 inches diameter and 39 inches high; attachment for Riehlé tensile-testing machine for cross-breaking tests; volumeter for determining specific gravity and volume of briquets; direct-reading volumeter of the overflow type; hydraulic molding machine for molding plastic briquets; dies for molding pyrometer tubes and refractory protecting tubes; laboratory furnace utilizing a modification of "surface combustion" so as to use highly preheated air and gas; and a new type of clay washer which works on the principle of the dust separator.

COOPERATIVE WORK WITH THE OHIO GEOLOGICAL SURVEY.

The most important refractory raw material is fire clay, because of its many applications and its wide distribution. A complete survey of the fire-clay resources of the country by a single agency with limited laboratory force and equipment would require 10 to 15 years. Hence cooperation with State geological surveys is advisable. The Columbus station accordingly has made a cooperative agreement with the Ohio geological survey for investigating the high-grade fire clays of the State.

The survey has collected the samples and is to analyze them. The experiment station is to test the samples and classify them according to their values as refractory materials. The results will be published as a cooperative report.

SPALLING TESTS OF FIRE BRICK.

Spalling tests of fire brick were undertaken in order to obtain additional data for the committee on refractories of the American Society for Testing Materials.

Three different tests were made for comparison: (1) Heating one end of the brick and quenching in water; (2) heating the entire brick and quenching; (3) first coating one end of the brick with slag and treating as under No. 1. The results obtained indicated that the spalling of the brick was very nearly the same under each method.

FAIRBANKS STATION.

WORK ON LIGNITE.

Perhaps the most important work done by the station at Fairbanks, Alaska, during the year was the investigation of lignite from the Nenana field, as a source of the cheaper power so vitally necessary for the advancement of gold mining in this district. With the cooperation of the Alaskan Engineering Commission tests were made at the Commission's power plant at Nenana, the lignite being from the only two mines now busy in the field. For comparison, a test was made of dry spruce wood under the same conditions. Weathering tests of lignite were also made.

The possibility of utilizing the lignite in a central power station, with transmission lines to the mining districts, was carefully investigated, and the construction and operation of such a plant was recommended. Valuable assistance and cooperation in this work was given the station by the Alaska chapter of the American Mining Congress.

METALLURGICAL WORK.

Metallurgical tests are being made to determine the amenability in selecting machinery for concentration plants; to increase the efficiency of mills already in operation, and generally to prevent waste of mineral resources. Tests made during the year include the recovery of gold from heavy sands remaining in placer sluice-boxes after a "clean-up"; the concentration of chromite in beach sand; the separation by flotation of molybdenite from low-grade ore; the concentration of gold-bearing antimony ore; and the investigation of tailings from three stamp mill amalgamation plants.

ASSISTANCE TO MINE OPERATORS AND PROSPECTORS.

Mineral specimens are identified without charge: the economic minerals present but not their amount being ascertained. During the year 333 specimens were identified. The station also makes cus-

tom assays for a nominal charge, there being no commercial assayer at present in the district. Seventy-four assays were made during the year.

Both the superintendent and the metallurgist of the station visited mining districts in order to become acquainted with operators, their problems and needs, and to give advice and assistance. On one of these trips Mr. Davis went to Cape Prince of Wales, visiting the mining districts en route.

A large proportion of the sixteen hundred visitors at the station during the year called to take advantage of the technical library, reading room, and mineral collection.

SUMMARY OF INVESTIGATIONS.

The following table summarizes the more important investigations of the station during the year:

Investigations at Fairbanks station.

Investigation.	Persons employed.	Duration.
Antimony concentration	Davis, Gross, Hopkins	Three months.
Assaying and mineral identification	Hopkins	Seven months.
Gold recovery from black sand	Davis, Gross, Hopkins	Two months.
Lignite	Davis	Four months.
Mill tailings	Gross	Two months.

John A. Davis was superintendent of the station, John Gross, metallurgist, and Paul Hopkins, chemist.

GOLDEN STATION.

HELIUM INVESTIGATIONS.

During the year R. B. Moore, superintendent of the Golden station, was in charge of the three experimental helium plants in Texas for producing helium, and was away from the station much of the time. An account of the work done by the Bureau of Mines in Texas appears on pages 678 and 679.

INVESTIGATIONS OF RADIUM.

CHEMICAL EFFECT OF RADIUM EMANATION.

During the year S. C. Lind, physical chemist, made an exhaustive study of some of the chemical effects of radium emanation in gas reactions. The combination of hydrogen and oxygen to form water was studied in glass spheres differing in diameter by 1 to 5½ centimeters. The chemical effect of "recoil atoms" was demonstrated for the first time and shown to be proportional to the ionizing effects, as in the case of alpha particles. These researches are described elsewhere.[a]

[a] Lind, S. C., Chemical action produced by radium emanation: Jour. Am. Chem. Soc., vol. 41, April, 1919, pp. 351–551; pp. 551–559.

DETERMINATION OF SILICA IN RADIUM-BARIUM SULPHATES.

C. W. Davis, junior chemist, worked out methods for determining silica in radium-barium sulphates, the ordinary radium concentrates in the manufacture of radium.

NEW DEPOSIT OF URANIUM ORE.

A new deposit of uranium ore near Lusk, Wyo., supposed to be uranophane, a hydrated silicate of uranium and calcium, was examined by Dr. Lind; analytical determinations were made by C. W. Davis. This is the first uranium ore, besides carnotite and pitchblende, to be found in commercial quantity in the United States. A preliminary description of the deposit and the ore was published in Science.[a]

SPECTRUM OF THE RADIUM EMANATION.

In cooperation with the bureau, Prof. R. E. Nyswander, of Denver University, is redetermining the spectrum of the radium emanation. This work is incomplete.

ZIRCONIUM.

Dr. J. W. Marden, associate chemist, M. N. Rich, assistant metallurgist, and L. W. Dunham, junior analytical chemist, worked on zirconium with the object of determining first, the properties of the pure metal and, second, new methods for making the pure oxide for commercial purposes. A satisfactory method for obtaining pure zirconium oxide has been developed, and a considerable number of samples of the pure metal have been prepared and their properties determined. The results will be published by the Bureau of Mines.

WORK ON MOLYBDENUM.

FLOTATION OF MOLYBDENITE ORES.

Under a cooperative agreement between the Primos Exploration Co., with mill and mines at Empire, Colo., and the Bureau of Mines, the best methods of flotation for recovering molybdenite from ores were studied. W. H. Coghill, of the Seattle station, and J. P. Bonardi, of the Golden station, worked in the station laboratory and in the mill of the Primos Exploration Co. An increased recovery of between 15 and 20 per cent was obtained, which meant a saving of over $1,000 a day to the company when the mill was running at full

[a] Lind, S. C., and Davis, C. W., A new deposit of uranium ore: Science, vol. 49, May 9, 1919, pp. 441–443.

capacity. The results of this work will be published by the bureau under the title "Experimental and Commercial Flotation of Molybdenite."

MICROSCOPIC EXAMINATION OF ORES.

In connection with the above work, Mr. Coghill and Mr. Bonardi developed methods for the microscopic examination of ores, which were described in a technical paper, "Approximate Quantitative Microscopy of Pulverized Ores," now in press.

DETERMINATION OF MOLYBDENUM.

Methods of analyzing molybdenum ores, especially those of low grade, have been carefully studied by J. P. Bonardi, of the Golden station, and E. P. Barrett, now of the Salt Lake City station. The results will be published in a technical paper on "Determination of Molybdenum" now in press.

METALLURGY OF WULFENITE.

During the year, J. P. Bonardi finished work on the metallurgy of wulfenite and prepared a paper dealing with the best methods of extracting molybdenum and lead from wulfenite, giving an original method and the best conditions for the precipitation of molybdenum as calcium molybdate. This paper is published elsewhere.[a]

Mr. Bonardi also studied the best conditions for the separation of wulfenite from barite minerals, and prepared a paper on the subject.

TUNGSTEN.

A bulletin entitled "The Treatment of Tungsten Ores of Boulder County, Colo.," written by Mr. Bonardi, of the Golden station, and J. C. Williams, of the Colorado School of Mines, describes the ore-dressing methods used in treating the ferberite ores of Boulder County, and the metallurgical processes used in connection with these ores.

PHOSPHORESCENT ZINC SULPHIDE.

Dr. Lind and C. W. Davis did considerable work on phosphorescent zinc sulphide used in connection with radium luminous paint. They studied the causes of luminosity in such paint and the reasons for changes in luminosity after the radium and the zinc sulphide are mixed.

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[a] Bonardi, J. P., Notes on the metallurgy of wulfenite; Chem. and Met. Eng., vol. 21, Sept. 15, 1919, pp. 364–369.

VANADIUM INVESTIGATIONS.

CUPRODESCLOIZITE.

Cuprodescloizite, a lead, vanadium, and copper mineral, has never been treated commercially thus far in this country. J. C. Conley worked out methods for the treatment of the ore; the details were published elsewhere.[a]

VANADINITE.

Vanadinite, or lead vanadate, was once treated on a commercial scale in this country, but without success. Mr. Conley made a careful study of the methods of treating this mineral, the results being published in a technical journal.[b]

MONAZITE.

In cooperation with the General Land Office, Salt Lake City, N. J. Fibush, mineral examiner, made tests to determine whether certain lands in the Boise Basin should be classed as mineral lands. Electromagnetic separation of the materials concentrated from the monazite sands of the Boise Basin showed that the gold content alone of the sands would justify classifying the lands as mineral lands.

MINNEAPOLIS STATION.

GENERAL STATEMENT.

At the beginning of the fiscal year the entire staff of the station was engaged on war problems connected with the production and utilization of manganese. The following work was done:

MANGANIFEROUS IRON ORES OF THE CUYUNA RANGE.

T. M. Bains, mining engineer, assisted by G. E. Ingersoll, assistant metal-mining engineer, examined the manganiferous iron mines of the Cuyuna Range in Minnesota. The approximate duration of the work was seven months.

BENEFICIATION OF MANGANESE ORES.

Ore dressing tests of manganese ores from various localities throughout the United States were made by J. T. Norton, ore-dressing engineer, in cooperation with the school of mines experiment

[a] Conley, J. C., Treatment of cuprodescloizite for extraction and recovery of vanadium, lead, and copper: Chem. and Metal. Eng., vol. 20, pp. 465–469.

[b] Conley, J. C., A proposed metallurgical process for the treatment of vanadinite for the recovery of lead and vanadium: Chem. and Metal. Eng., vol. 20, May 15, 1919, pp. 514–518.

station of the University of Minnesota. The work covered approximately eight months.

PRODUCTION OF MANGANESE ALLOYS IN THE BLAST FURNACE.

An investigation of blast-furnace practice for the production of ferromanganese and spiegeleisen by P. H. Royster, assistant physicist, assisted by F. B. Foley, assistant metallurgist, and R. L. Dowdell, junior metallurgist, occupied approximately eight months.

USE OF MANGANESE ALLOYS IN OPEN-HEARTH PRACTICE.

An investigation of the use of manganese alloys in open-hearth steel practice, by S. L. Hoyt, consulting metallurgist, assisted by F. B. Foley, assistant metallurgist, and R. L. Dowdell, junior metallurgist, covered about seven months.

JONES PROCESS.

Investigation of the Jones process for the direct reduction of manganiferous iron ore as a means of concentrating the manganese in such ore, was made by P. Christianson, metallurgist, and W. H. Hunter, metallurgical chemist, assisted by W. M. Sternberg, assistant chemist, and J. T. Jones, consulting engineer. The approximate duration of the work was three months.

BOURCOUD PROCESS.

Investigation of the Bourcoud process for direct reduction of iron ores was made by Messrs. Christianson and Hunter, assisted by F. H. MacDougall, physical chemist, and A. E. Bourcoud, consulting engineer. About two months were given to this work.

ANALYTICAL WORK.

Laboratory analytical work on steels, slags, and alloys, was done by C. E. Plummer, chief chemist, assisted in the course of the year by R. M. Winslow, W. J. Fullen, R. H. Hargett, junior chemists, and H. J. Livermore and J. H. Brennan, laboratory assistants. This investigation continued through the year.

LOW-GRADE GOLD ORES OF THE BLACK HILLS.

An investigation of low-grade sulphide gold ores of the Black Hills, S. Dak., by C. E. Julihn, superintendent, assisted by E. L. Smith, of the ore dressing department of the University of Minnesota, covered about three months.

IRON-MINING METHODS.

Study of mining methods on the Lake Superior iron ranges, by C. E. Julihn, superintendent, and G. E. Ingersoll, assistant metal-mining engineer, is in progress.

PITTSBURGH STATION.

Some of the mining investigations conducted by the Pittsburgh station, especially investigations of coal-mining methods, rescue and first-aid work, and the tests at the experimental mine at Bruceton, Pa., which includes physical testing of explosives, tests of explosibility of coal dusts, and experiments with geophones for mine work, have been described on earlier pages of this report. Other investigations are described below.

ELECTRICITY IN MINES.

The investigation of the use of electricity in mines was conducted at the Pittsburgh experiment station during the year with the following personnel:

L. C. Ilsley, electrical engineer, in charge; E. J. Gleim and E. C. Mills, assistant electrical engineers; A. B. Hooker, N. F. Fleming, R. A. Kearns, W. G. Thomas, and G. E. Highriter, junior electrical engineers. Only L. C. Ilsley and E. J. Gleim were employed throughout the year. The others worked 1 to 10 months.

The work consisted of the routine investigations connected with the approval of permissible apparatus, field investigations by Messrs. Mills and Gleim, and research investigations tending to the establishment of new schedules.

A new bulletin now in course of publication covers all of the equipments approved for coal-cutting apparatus. Considerable work has been done in collecting data on the mine laws of the various States, especially those laws relating to the use of electricity.

PETROLEUM LABORATORY.

The work of the petroleum laboratory at the Pittsburgh station covered a number of subjects as noted below. Some of the investigations have been described in the chapter on the work of the petroleum division, page 714.

Routine analysis of fuel oil, crude oil, lubricating oil, greases, and miscellaneous products.

After-corrosion of rifles. This investigation in progress from July 1 to November, 1918, included analyses of greases used for preventing corrosion in high-power rifles.

Miscellaneous investigations bearing on war conditions.

Airplane fuels. The experimental work in this investigation was completed about November, 1918, and reports for publication are now being prepared.

Development of apparatus and methods used in analyses of petroleum and its products. Work is still in progress.

Survey of grades of gasoline sold throughout the country. Work on this investigation began about April 1, 1919, and was in progress on June 30, 1919. It supplements a similar investigation made in 1917.

Comparison of crude oils produced in different fields of the United States. Work has been confined mostly to collections of samples.

Study of physical and chemical properties of hydrocarbons in different types of crude petroleum. The work done has dealt chiefly with development of methods for determination of properties and separation of products.

REPORTS PRINTED.

Various investigations have been described in the published papers mentioned below.

Present Status of Refinery Practice with Regard to Gasoline Production, by E. W. Dean; read February, 1919, at the New York meeting of the Society of Automotive Engineers.[a]

Adapting the Fuel to the Engine, by E. W. Dean and J. P. Smootz; read before joint meeting New York section of Society of Mechanical Engineers and Society of Automotive Engineers, April, 1919.[b]

A technical paper, Motor Gasoline, Properties, Methods of Analyses and Practical Specifications (a revision of Tech. Paper 166, Bureau of Mines), was completed by E W. Dean and issued by the bureau.

Papers in preparation include an article on airplane fuel investigation of the Bureau of Mines, by E. W. Dean and Clarence Netzen; reports on the production of gasoline by the vapor-phase cracking process, by E. W. Dean and W. A. Jacobs; the analytical distillation of petroleum, including high-boiling and emulsified oils, by E. W. Dean, H. H. Hill, and N. A. C. Smith; development of highly efficient apparatus and methods for the distillation of high-boiling oils; and a report giving a survey of the properties of commercial gasoline, by Messrs. Hill and Dean.

PERSONNEL.

The technical employees named below were on duty for varying periods during the fiscal year: E. W. Dean, petroleum chemist; W. A. Jacobs, assistant chemical engineer; H. H. Hill, assistant chemical

[a] Published in Jour. Soc. Autom. Eng., vol. 4, May, 1919, pp. 372–374.
[b] Published in Jour. Soc. Autom. Eng., vol. 4, June, 1919, pp. 495–496.

engineer; J. P. Smootz and N. A. C. Smith, assistant petroleum chemists; D. D. Stark, junior chemist; D. C. Dunn, E. E. Lyder, and A. D. Bauer, analysts.

CHEMICAL RESEARCH LABORATORY.

The investigations of the chemical research laboratory of the Pittsburgh experiment station were under the supervision of G. B. Taylor, physical chemist, from July 1, 1918, to January 15, 1919, and under the direction of A. C. Fieldner, supervising chemist, from January 16 to June 30, 1919.

The supervising chemist reports to the supervisor of stations, D. A. Lyon, through the superintendent of the Pittsburgh station. The investigative work of the laboratory is also under the general direction of the chief chemist, Charles L. Parsons, whose office is in Washington. Dr. G. A. Hulett, of Princeton University, and Dr. J. C. W. Frazer, of Johns Hopkins University, were on the consulting staff of the laboratory.

The normal work of this laboratory pertains to coal, coke, mine gases and natural gas, fuel gases, industrial gas masks, explosives, ventilation in mines, dust explosions in coal mines, rock dust in metal mines, and miscellaneous minerals.

During the war the normal work was displaced largely by special investigations for the War and Navy Departments, Emergency Fleet Corporation, United States Fuel Administration, and investigations in connection with the administration of the explosives regulation act.

ANALYTICAL LABORATORY—ROUTINE EXAMINATIONS.

Samples of fuel belonging to the Government and samples of fuels and other materials required in the course of investigations being made by the United States, State geological surveys, and experiment stations are analyzed in the general laboratory at the Pittsburgh experiment station.

The samples received and analyzed during the year are classified as follows:

Two hundred and thirty-five samples of coal, coke, and lignite collected in the course of various investigations of the bureau and of cooperative work with the United States Geological Survey, United States Fuel Administration, Alaska Engineering Commission, War Department, Panama Canal, and Illinois State Geological Survey.

Three hundred and ninety-eight samples from the mining division of the bureau, including 365 samples of coal, wood, rib, shale, and coked dust taken in the course of investigations of explosions and fires in coal mines; and 33 samples of miscellaneous materials.

Three hundred and thirty-five samples of coal, ash, clinker, residual fuel, fuel oil, soot, tar, and coke from the fuels division of the bureau. Most of these samples were taken in connection with fuel-efficiency investigations for the Emergency Fleet Corporation and the United States Fuel Administration; use of powdered coal; by-product coking investigations; the use of coke in house-heating furnaces; and efficiency tests of petroleum stills.

One hundred and ninety-one samples of graphite, aluminum ingots, lead ores, and pyrite from the war minerals investigation and the metallurgical division.

Fifteen samples of ceramic materials from the mineral technology division.

Eighteen samples of boiler water, gas-mask absorbents, and fire-extinguisher fluid from the War and Navy Departments.

One hundred and seventy-eight samples of dusts and glaze materials from the Division of Industrial Hygiene, Department of Labor, taken in connection with a survey of lead poisoning in potteries.

Fourteen samples of carbon black taken in connection with an investigation of the production of carbon black from natural gas.

In all, 1,384 samples were received, and 16,574 determinations were made.

ANALYTICAL LABORATORY—SPECIAL INVESTIGATIONS.

ANALYSIS OF GRAPHITE.

Methods for analyzing graphite were published in one of the war-minerals series of bulletins.

A quantitative method for the determination of graphitic carbon in the presence of amorphous carbon was devised, and a paper on this subject is in preparation.

FUSIBILITY OF COAL ASH.

A standard method for determining the fusibility of coal ash was developed in cooperation with the joint committee on coal analyses of the American Chemical Society and the American Society for Testing Materials.

A survey of the fusibility of ash of the various coals of the United States was continued throughout the year and the following papers were published in technical journals: "Fusibility of coal ash from West Virginia coals,"[a] "Fusibility of coal ash from the interior province coals,"[b] "Fusibility of coal ash from Pennsylvania coals."[c]

[a] Selvig, W. A., Fusibility of ash from West Virginia Coals: Coal Age, vol. 15, 1919, pp. 12–16.

[b] Selvig, W. A., Ratliff, W. C., and Fieldner, A. C., Fusibility of ash from coals found in the interior province: Coal Age, vol. 15, 1919, pp. 698–703.

[c] Selvig, W. A., and Fieldner, A. C., Fusibility of ash from Pennsylvania coals: Chem. and Met. Eng., vol. 20, June 15, 1919, p. 629; Coal Age, vol. 15, 1919, pp. 1086–1089.

PERSONNEL.

W. A. Selvig, assistant chemist, was in direct charge of the analytical laboratory. The personnel during the year included the following chemists who were employed for different lengths of time: F. G. Osgood and J. H. Capps, assistant chemists; W. C. Ratliff, J. I. Prest, L. R. Eckman, B. B. Westcott, O. C. Brown, William Hoffman, and I. S. Guest, junior chemists; W. E. Surbled, laboratory assistant; P. D. Watson, chemical laboratorian.

INVESTIGATION OF MINE GASES AND NATURAL GAS—ROUTINE EXAMINATIONS.

The work of the gas laboratory at Pittsburgh includes analyses of gas and air mixtures used in testing explosives, miners' lamps, gas detectors, and electrical equipment for coal mines; analyses of combustion products of explosives, gas, and air from oxygen breathing apparatus and respirators, natural gas collected by the United States Geological Survey and the petroleum division of the Bureau of Mines, flue gases, from fuel combustion investigations, and miscellaneous gases from various sources. During the year 1,590 samples of gas were analyzed involving 9,818 determinations.

INVESTIGATION OF MINE GASES AND NATURAL GAS—SPECIAL INVESTIGATIONS.

ANALYTICAL METHODS.

New and improved methods and apparatus for analyzing various gases were developed. The results of this work were published in technical journals, as follows: "An improved Orsat apparatus;" by G. W. Jones and F. R. Neumeister;[a] "A device for removing plugs from stuck stop cocks," by V. C. Allison;[b] "Sodium pyrogallate solution as an absorbent for oxygen," by G. W. Jones and M. H. Meighan;[c] "The determination of methyl chloride in gas mixtures," by V. C. Allison and M. H. Meighan.[d]

CHLORINATION OF NATURAL GAS.

The action of various substances as catalysts in chlorinating natural gas and thus producing carbon tetrachloride, chloroform, and

[a] To be published in Chemical and Metallurgical Engineering.

[b] Allison, V. C., A device for removing plugs from stopcocks: Jour. Ind. and Eng. Chem., vol. 11, May 1, 1919, p. 468.

[c] Jones, G. W. and Meighan, M. H., Sodium pyrogallate solution as an absorbent for oxygen: Jour. Ind. and Eng. Chem., vol. 11, April, 1919, pp. 311–316.

[d] Allison, V. C. and Meighan, M. H., The determination of methyl chloride in gas mixtures: Jour. Ind. and Eng. Chem., vol. 11, Oct., 1919, pp. 943–950.

methyl chloride, was studied and a report of this work was submitted for publication in a technical journal.[a]

USE OF ODORS FOR DANGER SIGNALS IN METAL MINES.

Work on the introduction of powerful nontoxic odors into the compressed-air pipes of metal mines for signalling danger to men at work underground was continued. Ethyl mercaptan, and amyl acetate were tried in one of the mines of the Anaconda Copper Co. This test and another in a mine in California demonstrated that many lives may be saved in disasters by using these odor signals. A technical paper on the subject has been submitted for publication.

USE OF ODORS FOR DETECTING LEAKS IN GAS-PIPING SYSTEMS AND CONTAINERS.

Odors may be used for detecting leaks in piping systems, steam boilers, and gas containers. The United Gas Improvement Co. and several other large gas companies are experimenting with odors for detecting leaks and for giving warning of escaping gas, such as "blue water gas," which is poisonous but odorless. This application of odors was taken up by the gas companies as a result of the publication, in technical journals,[b] of the work done by the bureau on the use of odors and stenches as warnings.

PERSONNEL.

Gas analyses were in charge of G. W. Jones, assistant chemist, assisted by V. C. Allison, assistant chemist; M. H. Meighan, F. R. Neumeister, and W. L. Parker, junior chemists; S. H. Katz, assistant chemist, cooperated in the tests of odor signals in mines.

EXPLOSIVES ANALYSES AND RESEARCH—ROUTINE INVESTIGATIONS.

The explosives chemical laboratory at Pittsburgh analyzes all explosives submitted for tests to determine their permissibility for use in dusty or gaseous coal mines, or their suitability for other industrial purposes.

Other duties of the laboratory include the analysis and inspection of explosives for other departments of the Government, the analysis and testing of miscellaneous explosive substances and related materials, investigations of methods for the analysis and testing of explosives and related material, and investigations of the preparation, properties, and uses of explosives and related materials.

[a] Jones, G. W., and Allison, V. C., Carbon tetrachloride chloroform, and carbon hexachloride from natural gas: Jour. Ind. and Eng. Chem., vol. 11, July, 1919, p. 639.

[b] Allison, V. C., and Katz, S. H., An investigation of stenches and odors for industrial purposes: Jour. Ind. and Eng. Chem., vol. 11, April, 1919. p. 336.

EXPLOSIVES ANALYSES AND RESEARCH—SPECIAL INVESTIGATIONS.

BLACK LIQUOR FROM SODA PULP PROCESS.

E. J. Hoffman, assistant chemist, investigated the possible use of the oily distillate derived from the destructive distillation of the evaporated black liquors from the soda pulp process as a possible raw material for explosives. The results of this investigation were published in a technical journal.[a]

NITRATION OF SUCROSE.

An investigation preliminary to the development of a method for determining nitrosucrose in dynamite was described in a paper on "Nitration of sucrose; sucrose octanitrate."[b] The increasing use of nitrosugars in explosives makes necessary the developing of a method for determining this material.

HEXANITRO-DIPHENYL-AMINE.

Mr. Hoffman and Mr. Dame investigated various methods for preparing hexanitro-diphenyl-amine and developed a simple method for preparing this explosive from chlor benzene and prepared a report[c] on the work.

HYGROSCOPIC PROPERTIES OF EXPLOSIVES.

At the request of the Ordnance Bureau of the War Department, the hygroscopic properties of black powder were investigated and the results reported in a paper by G. B. Taylor.

Similar experiments were made by W. J. Huff with reference to various grades of T N T.

AFTER-CORROSION OF RIFLES.

As part of military investigations started during the war, the explosives laboratory, in cooperation with the petroleum laboratory, investigated the after-corrosion of military rifles, and studied the anti-corrosive properties of a number of special greases.

PERSONNEL.

The explosives chemical investigations were in charge of F. K. Marvin, explosives chemist, until his death, October 24, 1918, from an attack of influenza incurred while investigating the munitions explo-

[a] Hoffman, E. J., Chemical investigation of black liquor: Paper, vol. 23, Jan. 15, 1919, pp. 11–13.

[b] Hoffman, E. J., and Hawse, V. P., Nitration of sucrose; sucrose octanitrate. Jour. Am. Chem. Soc., vol. 41, February, 1919, pp. 235–247.

[c] Hoffman, E. J., and Dame, P. A., The preparation of hexanitro-diphenyl-amine from chlor benzene: Jour. Am. Chem. Soc., vol. 41, June, 1919, pp. 1013–1020.

sion at the Gillespie plant in New Jersey. E. J. Hoffman, assistant chemist, was in charge from October 24 to December 31, 1918, and Wilbert J. Huff, physical-organic chemist from January 26, 1919, until the close of the year. Other members of the staff for varying lengths of time were: P. A. Dame, F. B. Doane, and H. L. Lentz, assistant chemists; L. J. Smolen, B. B. Kaplan, J. I. Bender, F. A. Burmingham, L. G. Marsh, G. H. Foster, C. C. Fuller, F. R. Neumeister, junior chemists.

MICROSCOPIC INVESTIGATIONS.

The microscopic investigations made at the Pittsburgh station include the examination of explosives, coal and rock dust, coal, graphite, and miscellaneous materials, Reinhardt Thiessen, assistant chemist, being in charge. Results of a comprehensive investigation of the constituents of American coal are now in press as a bulletin on Structure in Paleozoic Coals.

GRAPHITE AND GRAPHITE CRUCIBLES.

In connection with the investigation of the possible substituting of American for foreign graphite in making crucibles, Dr. Thiessen, by microscopic examination, ascertained why the American graphite makes poorer crucibles than Ceylon graphite, and how this difficulty can be overcome to some extent by suitably prepared fuel.[a]

INVESTIGATION OF GAS MASKS AND INDUSTRIAL GASES.

In response to the demands made for information as to the use of gas masks in metallurgical and allied industries the Bureau of Mines established at its Pittsburgh station a laboratory for the approval of gas masks and for the investigation of masks and respirators for specific purposes. This laboratory also investigates industrial gases, and rock dusts in mines, and the protection of workmen engaged in these industries. Some of the problems studied during the year were as follows:

GAS INDICATORS AND DETECTORS.

Portable indicators for oxygen, carbon dioxide, methane, hydrogen, benzol and gasoline vapor were devised, the following technical papers were prepared for publication: "Indicators for oxygen and carbon dioxide," by L. H. Milligan, D. O. Crites, and W. S. Wilson: "Methane and combustible gas detectors," by L. H. Milligan, J. J. McKittrick, and D. O. Crites.

[a] Thiessen, Reinhardt, Structure of graphite in relation to crucible making: Jour. Am. Ceramic Soc., vol. 2, July, 1919, pp. 508–542.

APPROVAL OF GAS MASKS.

A large gas chamber and other apparatus was installed for approval tests of industrial gas masks. Schedule 13, "Procedure for establishing a list of permissible gas masks, fees, character of tests and conditions under which gas masks will be tested" was prepared for publication.

A paper on "Industrial use and limitations of respirators, gas masks and oxygen breathing apparatus" by A. C. Fieldner, was published in technical journals.[a]

The use of gas masks in sulphur dioxide atmospheres at smelters was investigated by A. C. Fieldner and S. H. Katz, and a report published.[b]

GAS MASKS FOR FIGHTING FIRES.

As city fire departments have purchased Army gas masks as smoke protection and are anxious to know what dependence can be placed on their use at fires, a paper entitled "The use of the Army type of gas masks in fighting fires," by A. C. Fieldner, S. H. Katz, and S. P. Kinney, was prepared for publication.

DANGER FROM THE USE OF CARBON TETRACHLORIDE FIRE EXTINGUISHERS IN SMALL ROOMS.

A comprehensive investigation of the various gases produced when a carbon tetrachloride fire extinguisher is used to put out a fire in a small room has shown that dangerous quantities of highly poisonous decomposition products are formed. Gas masks will protect the user of such a fire extinguisher from these products.

SAMPLING AND EXAMINATION OF ROCK DUST FROM ATMOSPHERES IN METAL MINES.

In cooperation with the United States Public Health Service various methods of collecting rock-dust samples from the atmospheres of metal mines were investigated and the sugar-tube method was improved so as to give more accurate results.

PERSONNEL OF GAS-MASK AND ROCK-DUST INVESTIGATIONS.

The gas-mask investigations were directed by A. C. Fieldner, supervising chemist, formerly in charge of gas-mask research of the

[a] See also Fieldner, A. C., and others, Methods of testing gas masks and absorbents, Jour. Ind. and Eng. Chem., vol. 11, June, 1919, pp. 519–540; Protection afforded by Army gas masks against various industrial gases, Jour. Ind. and Eng. Chem., vol. 11, July, 1919, pp. 622–623; Fieldner, A. C., and Fogler, B. B., Use of Army gas masks in industries, Jour. Ind. Hygiene, vol. 1, 1919, pp. 69–75.

[b] Fieldner, A. C., and Katz, S. H., Army gas masks in sulphur dioxide atmospheres: Eng. and Min. Jour., vol. 107, Apr. 19, 1919, pp. 693–695; Chem. and Met. Eng., vol. 20, June 1, 1919, pp. 582–586.

gas investigations of the Bureau of Mines and the Chemical Warfare Service. S. H. Katz, assistant chemist, was in direct charge of the gas-mask laboratory and had the aid of S. P. Kinney and E. W. Longfellow, junior chemists. G. E. McElroy, assistant sanitarian, United States Public Health Service, aided in the rock-dust investigations.

CARBON-BLACK INVESTIGATION.

G. St. J. Perrott, physical chemist, in cooperation with R. O. Neal, gas engineer, of the Bartlesville station, investigated the production of carbon black from natural gas. More exact methods are being developed for testing carbon black and a study is being made of its structure, with a view to increasing yields without sacrificing essential properties.

PHYSICAL LABORATORY.

The physical laboratory at the Pittsburgh station tests and calibrates physical apparatus and measuring instruments used in the work of the bureau. The instruments calibrated include potentiometers, millivoltmeters, thermocouples, pyrometers, barometers, psychrometers, mercury thermometers, and miscellaneous instruments.

F. C. Houghten, assistant physicist, who was in charge, was aided by Paul B. Taylor, junior physicist, from February 14, 1919, to June 30, 1919.

SULPHUR IN FUELS.

A. R. Powell, assistant organic chemist, is studying the forms of sulphur in coal and the changes in coking, including the percentage distribution between coke and gas under various conditions of carbonization. A paper on "Sulphur in producer gas" was prepared under the direction of Prof. Fred. Crabtree, of the Carnegie Institute of Technology, consulting metallurgist of the bureau.

FUELS SECTION.

The work of the fuels section of the Pittsburgh station pertains to the efficient use of fuels in steam boilers and furnaces, the use of powdered coal, or fuel in refining oils, of coke for house-heating purposes, and of gas in metallurgical furnaces, heat transmission in steam boilers, combustion in underfeed stokers, etc.

During the war regular work was displaced largely by special investigations of marine boilers for the Emergency Fleet Corporation.

The work of the fuels section was in charge of Henry Kreisinger, engineer. The investigations mentioned have already been described

under the work of the fuels and mechanical equipment division, on pages 701 and 704.

ADMINISTRATION OF THE STATION.

The administrative work of the Pittsburgh station was in direct charge of D. A. Lyon, supervisor of stations. W. R. Talbot, as chief clerk, acted as general assistant to Mr. Lyon. The administrative division may be divided into six sections, as follows: Technical service, clerical, purchases and supplies, library and translations, mechanical, care of buildings and grounds.

In the technical service section of the station are draftsmen, photographers, computers, and stenographers, who cooperate closely with investigators and field men in the design and delineation of special apparatus, the reduction of observations, the making of photographs, and drawing charts to illustrate publications. Copies of all pictures, drawings, computations, and reports are kept in well-indexed files, ready for reference. The work of the section is in charge of R. A. Wood.

The clerical section includes stenographers, clerks, a telephone operator, and messenger boys.

The purchasing agent, assisted by a proposal clerk, order clerk, and voucher clerk, purchases all equipment and supplies used by the administrative and technical sections of the station.

The supply room carries in stock commonly used materials, which are purchased in bulk and issued to the various sections on requisition, as needed. The supply-room clerk looks after the receiving and shipping of all materials entering or leaving the plant.

The station library contains over 6,000 technical publications and magazines. The accessions during the year consisted chiefly of bound periodicals and of Government publications, lack of funds preventing the purchase of new technical books. A library bulletin, containing an index to articles of interest in journals received by the library, is prepared semimonthly and sent to technical employees, field stations, and to other libraries interested.

The mechanical section, under the direction of a mechanical superintendent, has charge of the power plant, instrument shop, carpenter and machine shops, and the workmen who make installations and repairs. The power plant which furnishes power, light, and heat for the buildings, is equipped with two 250-horsepower Babcock & Wilcox boilers; one 225-horsepower Parker boiler, with chain-grate stokers; three Nordberg poppet-valve engines; one 70-kilowatt motor-geenrator set, 110 and 220 volts; one 35 kilowatt motor-generator set, 250 volts, and accessories. The mechanical superintendent also has charge of the watchmen, charwomen, and laborers.

SALT LAKE CITY STATION.

GENERAL STATEMENT.

The station at Salt Lake City has a cooperative agreement with the University of Utah, the superintendent of the station, Thomas Varley, being the metallurgist in charge of the department of metallurgical research of the University.

From funds donated by mining companies, business men, and the State, the total amounting to $36,000, the metallurgy building has been enlarged and the department now occupies new offices and laboratories. The mill has been rearranged and much new equipment added, so that the apparatus is now complete as that of any ore-testing laboratory in the country. In a separate building new volatilization equipment has been installed, including a large rotary kiln, and electrical apparatus for precipitating the fumes. The Western Precipitation Co. and the Research Corporation have cooperated in installing the equipment. As this is the only laboratory in the country equipped for research work in connection with volatilization, ores have been submitted from numerous localities and many requests for tests have been received from different mining districts. Since its completion the plant has been busy almost continuously.

The station is also equipped with small-scale furnaces and apparatus.

A bulletin descriptive of the department of metallurgical research, its research work, personnel, laboratories and equipment, is now in course of publication by the University of Utah.

The State legislature has appropriated $25,000 for cooperative work during the next two years with the United States Bureau of Mines. This amount exceeds by $5,000 each year the previous allotments made by the State for this work.

The personnel of the Salt Lake City station is as follows: Thomas Varley, superintendent; F. G. Moses, hydrometallurgist; J. C. Morgan and E. P. Barrett, assistant chemists; R. E. Head, metallurgical assistant.

VOLATILIZATION INVESTIGATIONS.

Cooperative work with the Berkeley station on theoretical investigations of the chemistry of the volatilization process is in progress.

The treatment of the precipitated fume with regard to the highest practicable recovery of the valuable metals is being investigated.

WAR MINERALS WORK.

The Salt Lake City station did considerable work on war minerals.

Thomas Varley continued work, begun at the Seattle station, on the concentration of low-grade chrome, quicksilver, and manganese

ores, a report on the concentration of chrome ores being forwarded to Washington for publication. He also investigated, in cooperation with the Berkeley station and with the assistance of H. B. Hansen, flotation assistant, the flotation of the quicksilver ores of the Pacific Coast.

F. G. Moses, assisted by H. W. Clark, laboratory assistant, spent several months investigating American graphite and their suitability for making crucibles, the results of these investigations being summarized in a paper on Refining Alabama Flake Graphite for Crucible Use, issued in mimeographed form as No. 8 of the war minerals investigation series and now in course of publication in a technical paper.

R. E. Head, in charge of the microscopic work at Salt Lake City, made microscopic determinations, polished sections, and photographs of graphite, manganese, chrome, lead and zinc ores, and coal pyrite.

POTASH.

Small scale tests, followed by larger scale runs, were made during the year. Satisfactory results were obtained in the recovery of potash from alunite.

Tests made by the National Potash Co., at the plant of the Utah Portland Cement Co., of tailings from the Utah Copper Co., and from Cripple Creek, Colo., were observed, the object of these tests being to demonstrate on a large scale the adaptability of the Edwards process for the recovery of potash.

OIL SHALES.

M. J. Gavin, of the petroleum division of the Bureau of Mines, who was detailed to Salt Lake City during the larger part of the year, is carrying on oil-shale research with the assistance of W. D. Bonner, consulting chemist, T. B. Brighton, and E. L. Quinn, assistant research chemists.

In cooperation with persons in Salt Lake City, runs are being made at an experimental plant there and data gathered for future use.

MICROSCOPIC WORK.

During the year R. E. Head was transferred back to Salt Lake City and provided with the equipment necessary for microscopic work.

He was of material assistance to the war minerals investigations and had also aided the Salt Lake City station and other field stations of the bureau.

RECOVERY OF ZINC.

Some work was done on zinc precipitation from hydrometallurgical solutions by means of SO_2, with satisfactory results, except for ores containing large excesses of iron and manganese. A simple and cheap means of removing both is being sought.

Cooperative work on zinc residues has begun with a view to obtaining a maximum extraction of zinc from sludge by leaching.

SMOKE INVESTIGATIONS.

The State of Utah and the city of Salt Lake have each appropriated $5,000 to be used in investigating methods of abating smoke in Salt Lake City, in cooperation with the Bureau of Mines. During May, F. K. Ovitz, superintendent of the Seattle station, made a preliminary investigation of conditions at Salt Lake City and submitted his recommendation to D. A. Lyon, the supervisor of stations. The work will be under the direction of the bureau.

SEATTLE STATION.

GENERAL STATEMENT.

During the fiscal year the Seattle mining experiment station cooperated with the University of Washington at Seattle, the University of Idaho at Moscow, and the Oregon Bureau of Mines and Geology at Portland. During the early part of the year the work was mainly war minerals investigations; during the latter part of the year investigations regularly assigned to the station were resumed.

In September the ore-dressing work, with the exception of that on flotation under W. H. Coghill, was transferred to Salt Lake City, and the mining, preparation, and utilization of coal received more attention. During the year the investigation of the ceramic materials of the State of Washington was undertaken.

COOPERATION WITH THE UNIVERSITY OF WASHINGTON.

The State legislature appropriated $20,000 to continue the cooperative work for the biennium ending April 1, 1921, and an additional sum of $25,000 to erect a building for a coal laboratory. This building will contain equipment for experimental coal washing, work on the utilization of coal and on ceramics.

Through the action of the board of regents of the university, a temporary addition to the Mines Building is being erected to provide space for experiments in burning pulverized coal.

In cooperation with the University of Washington, four lines of investigation are in progress, as follows: Coal, electrometallurgy, flotation, and ceramics.

COAL.

The coal investigations outlined include: Mining, with special reference to efficiency and safety; washing; storage of pulverized coal, and utilization of the small sizes. Development problems of the Alaskan coal fields are also a part of the work.

COAL MINING.

The coal-mining investigations were in charge of G. W. Evans, coal-mining engineer. A bulletin on Coal Mining in the State of Washington, which discusses the coals, the mining methods, and the costs, was completed and submitted for publication.

The causes of "bumps," or "bounces," which frequently occur under approximately 2,000 feet of cover in the mines of the Utah Fuel Co. at Sunnyside, Utah, were found to be due to movement along two normal faults because of the heavy stratigraphic pressure. Bumps at the No. 11 mine, Black Diamond, Wash., were found to be due to the heavy cover and the manner of removing pillars.

Mr. Evans was selected by Secretary Lane as a member of a party to report on the coal beds being developed in the Matanuska field, Alaska. The other members of the party were G. C. McFadden, chief engineer, and L. A. O. Gabany, geologist, both of the Peabody Coal Co. In September the party left for Alaska and made a general survey of fuel problems.

During the year numerous conferences were held with holders of coal-land leases in the Bering River field to aid them in developing their properties, and conferences were held with the commission sent to Alaska by the Navy to consider establishing a coal station there.

COAL WASHING.

In January Earl R. McMillan was appointed junior mining engineer to carry on coal-washing investigations with Mr. Evans. As a first step float-and sink tests were standardized and the application of the results to the operation of coal-washing plants was investigated.

The work done has revealed a lack of careful washing. At one plant recently sampled, the ash, 19 per cent, was reduced approximately 2 per cent in the sizes over one-half inch and was increased correspondingly in the sizes under one-half inch, the washery loss being 5 per cent. Float-and-sink tests showed a possible theoretical reduction of ash to 12 per cent for all sizes by washing with a recovery of 87 per cent. If this instance is typical of other washing plants in the State, it means that with a coal production of 4,000,000 tons annually, 7,000 freight cars are required to haul useless freight that could be eliminated at the mine.

COAL STORAGE.

Replies to a questionnaire sent to coal operators, large consumers, and dealers indicate that only a small amount of coal is stored in Washington because of the nearness of the mines to the markets and the ability of the consumers to obtain coal at all times of the year.

The increasing use of pulverized coal gives rise to storage problems, such as unexplainable fires in bins. Many engineers believe that moisture is an important factor in causing such fires. Preliminary experiments indicate the need of giving the problem further study.

POWDERED COAL.

Because of the inadequate demand for small sizes of coal in the Northwest large quantities of these are wasted. An increased use of powdered coal for generating steam offers a possible means of utilizing much of this material. Under the encouragement of the Pacific Coast Coal Co., the use of powdered coal has progressed and already several plants in Seattle are burning it.

Arrangements were made with the University of Washington to build a small experimental combustion chamber for burning powdered coal. Some of the subjects to be studied are: Sizes of coal, air pressure at burner, effect of moisture, air supply, disposal of ash, effect of burning coal on fire brick, and reactions during combustion.

Mr. Ovitz made a trip to Dover, Ohio, to attend the second test of the Roberts by-product coke ovens. A paper on "Ammonia in producer gas" was written for publication in technical journals.

ELECTROMETALLURGY.

F. C. Ryan, electrometallurgist, who went to Ithaca, N. Y., to assist Dr. Gillett in electric-furnace work, resigned from the bureau in September. Charles D. Grier was appointed assistant metallurgist in January. His thesis, "Electrometallurgical and electrochemical industries in Washington," was published by the engineering experiment station of the University of Washington, as Bulletin 5. He also prepared a report on the work done the year before in the recovery of waste tin.

Owing to delays in receiving certain parts and supplies, the electric furnace equipment was not finally installed until near the end of the fiscal year. Outside interests will be permitted to use the equipment under cooperative agreements, so that excellent laboratory facilities will be made available to those without suitable equipment.

An experimental electric furnace has been designed for smelting copper fume.

FLOTATION.

Flotation investigations were under the direction of Will H. Coghill, metallurgist, assisted by Carl O. Anderson, junior metallurgist, who entered on duty February 24.

In the theoretical work on the flotation of ores effort has been made to gain a better grasp of physical and chemical principles that have been brought to attention by various writers. This theoretical work is now well advanced and its application to ore treatment is in progress.

Under a cooperative agreement with the Primos Exploration Co., Mr. Coghill, assisted by J. P. Bonardi of the Golden station, made a practical application at a 200-ton flotation plant treating molybdenite ore of some of the results of the laboratory work. The highly satisfactory results are mentioned in the chapter on the work of the Golden station, page 738.

Under a cooperative arrangement with the Forest Products Laboratory of the United States Department of Agriculture, Madison, Wis., the hardwood tar oils are to be fractionated and their physical and chemical properties determined by the Forest Products Laboratory. The suitability of the oils for flotation will be tested by Mr. Coghill.

Papers relating to flotation were published during the year, as follows: "Hand device for flotation experiments," by W. H. Coghill;[a] "Why water overflows a tumbler and floats glass plates and flaky minerals," by W. H. Coghill and C. O. Anderson;[b] "Approximate quantitative microscopy of pulverized ores," by W. H. Coghill and J. P. Bonardi.[c]

Papers on the experimental flotation of Black Butte cinnabar ore, the experimental and commercial flotation of Primos molybdenite ore, the equilibrium of three-phase systems of two liquids and a gas, and the equilibrium of three-phase systems of a solid, a liquid, and a gas are in course of preparation, as is a bulletin on flotation.

CERAMICS.

In December, Ira A. Williams was appointed assistant professor of ceramics in the college of mines, University of Washington and also ceramist of the Bureau of Mines, a department of ceramics being established in the College of Mines which will cooperate with the bureau.

Mr. Williams made a general survey of the ceramic situation, and started to obtain equipment for a ceramic laboratory in the

[a] Published in Min. and Sci. Press, vol. 118, Apr. 12, 1919, p. 495; Chem. and Met. Eng., vol. 20, May 15, 1919, p. 537; Eng. and Min. Jour., vol. 107, June 21, 1919, p. 1090.

[b] Published in Sci. Am. Suppl., July 27, 1918, p. 52.

[c] Technical Paper 211, Bureau of Mines.

College of Mines. He resigned in May to return to the Oregon Bureau of Mines and Geology.

As a result of efforts to have the clay workers of the Northwest consider the manufacturing and technical problems of the industry and the possible investigations to be undertaken, the second annual convention of the Northwestern Clay Products Manufacturers' Association was held in February at the Seattle station.

ORE DRESSING.

During the first part of the year Thomas Varley and A. H. Fischer, in connection with war minerals investigation problems, made concentration tests of 15 lots of chrome ores, including samples from Auburn, Calif., San Louis Obispo, Calif., Golconda, Oreg., and Cypress Island, Wash. These tests showed that high-grade concentrates can be procured from low-grade ores, with recovery of 75 to 85 per cent of the total chromite.

Concentration tests were also made of manganese ore sent from the Berkeley station, and ore from the vicinity of Baker, Oreg.

CHEMICAL LABORATORY.

The work of the chemical laboratory consisted of the analysis of coal, molybdenum ores, gold and silver concentrates, examination of war minerals, etc. In addition, a rapid and accurate method for determining titanium and chromium in beach sand was developed by E. P. Barrett.[a]

In an attempt to solve difficulties in assaying some low-grade molybdenum ores Mr. Barrett, in collaboration with Mr. Bonardi, of the Golden station, worked out details of a gravimetric and of a volumetric method that gave satisfactory results. The two methods are described in a technical paper.[b]

Equipment for making more accurate analyses of coal was added to the chemical laboratory. The chemical work for the station was done by E. P. Barrett until April 1, when he was transferred to Salt Lake City and replaced by J. Irving Prest, from the Pittsburgh laboratory.

PERSONNEL.

The personnel of the station during the year included Thomas Varley, metallurgist and superintendent, transferred to the Salt Lake City station September 16, 1918; Frank K. Ovitz, fuel engineer and

[a] Barrett, E. P., A rapid method for determining titanium and chromium in beach sand.: Min. and Sci. Press, vol. 117, Nov. 30, 1918, pp. 729–730.

[b] Bonardi, J. P., and Barrett, E. P., The determination of molybdenum: Tech. Paper 230, Bureau of Mines. 1919. (In press.)

superintendent, detailed to Seattle September 16, 1918; George Watkin Evans, coal-mining engineer; Will H. Coghill, metallurgist; Francis C. Ryan, electrometallurgist, resigned in September, 1918; E. P. Barrett, assistant chemist, transferred from Pittsburgh station March 15, 1919; Edward J. Savannah, junior chemist, entered on duty August 1, 1918, resigned to enter military service September 30, 1918; Bertram J. Cross, junior chemist, transferred from Pittsburgh station March 31, 1919; Arthur H. Fischer, assistant metallurgist, resigned September 16, 1918; Charles D. Grier, assistant metallurgist, entered on duty January 2, 1919; Earl R. McMillan, junior mining engineer, entered on duty January 7, 1919; Carl O. Anderson, junior metallurgist, entered on duty February 24, 1919; J. P. Bonardi, assistant chemist, detailed from the Golden station during March, April, and May.

The personnel of the college of mines representing the university in the cooperative work comprised Milnor Roberts, dean of the school of mines; Clarence R. Corey, metallurgist; Ira A. Williams, ceramist; and E. R. Wilcox, fellow in electrometallurgy.

COOPERATION WITH THE UNIVERSITY OF IDAHO.

The work at the University of Idaho was in charge of C. A. Wright. A statement regarding the nature and results of the cooperative work carried on at Moscow is printed on pages 764 and 765.

COOPERATION WITH THE OREGON BUREAU OF MINES AND GEOLOGY.

Mr. Varley examined various chrome-ore deposits in Oregon. Manganese deposits at Lake Creek, Jackson County, were investigated.

During the latter part of the year G. E. Stowell, assistant mining engineer of the Oregon bureau, was detailed to Seattle to study the concentration by flotation of the silver-gold ore from the Ben Harrison mine. With the information gained from the study, a method of treatment giving a recovery of about 90 per cent of the gold and silver in the ore was developed.

TUCSON STATION.

TREATMENT OF PORPHYRY COPPER ORES.

During January the offices and laboratories were moved into the new quarters in the new mines and engineering building of the University of Arizona. The new metallurgical laboratory was equipped during the last quarter of the fiscal year.

The principal work of the Tucson station was the continuation of the problem of leaching mixed sulphide and nonsulphide porphyry

copper ores, the operations involved being as follows: Roasting, leaching, recovery of dissolved copper and of sulphide copper, thickening, settling, decantation, precipitation, and flotation.

Work was done at the Tucson laboratories and at the 100-ton cooperative test plant at the mill of the Miami Copper Co.; the cooperative staff included C. E. van Barneveld, supervising mining engineer and metallurgist, E. S. Leaver, metallurgist (personal supervision at Miami), G. E. Postma, junior chemist (routine and special laboratory work), C. L. Vance, fellow, for the Bureau of Mines, and H. D. Hunt, research engineer, and R. V. Thurston, assistant research engineer for the Miami Copper Co. Messrs. Hunt and Thurston worked under the direction of E. S. Leaver who spent probably one-third of his time during the year in direct charge of Miami operations.

SPONGE IRON.

The principal sources of SO_2 for dissolution of copper are either waste sulphurous roaster gases, from copper smelters, or iron pyrites or iron-copper-sulphide concentrates rich in iron.

Small-scale laboratory work on the deoxidation of pyrite calcines to furnish a precipitant for copper extracted by leaching was done at Tucson by Messrs. van Barneveld, Leaver, Postma, and W. E. Weiland, analyst, assisted by C. L. Vance, fellow.

WAR-MINERALS WORK.

C. E. van Barneveld spent about one-half of his time during the eight months from April to November, inculsive, on war-minerals work, principally in investigating manganese resources and in concentration and leaching tests of low-grade siliceous manganese ores.

The Tucson staff, including Messrs. Leaver, Postma, and Weiland, assisted by C. L. Vance, fellow, were engaged in the development of an SO_2-leaching process for low-grade siliceous, secondary manganese ores. Negotiations were in progress for the construction of a 250-ton unit at one of the western smelters when the armistice was signed and the project abandoned.

URBANA STATION.

GENERAL STATEMENT.

During the fiscal year ending June 30, 1919, the work done at the Urbana station, in cooperation with the University of Illinois, under a cooperative agreement, included various investigations, as follows:

1. The study of subsidence from underground mining.
2. The origin and control of mine fires with particular reference to those in the coal mines of the central field.

3. Additional work on coal mine atmospheres to complete work undertaken by H. I. Smith, formerly stationed at Urbana, in order to finish a bulletin on the subject undertaken by Mr. Smith.

4. The study of the occurrence of sulphur in coal with a view of: (1) Lowering the sulphur content of the coal so as to make it more suitable for gas manufacture, and (2) to obtain, if possible, the sulphur in the form of pyrite in commercial quantities.

5. A general investigation of coal-washery practice in the Middle West with a view to the improvement of existing methods so as to eliminate as far as possible the loss of coal and to lower the ash and sulphur content of the finished product to the practicable minimum.

6. A general study of water-gas manufacture with a view to utilizing Illinois high-sulphur coals in place of coke and the more expensive eastern coals.

7. Analyses of mine gases and coal mine atmospheres.

SUBSIDENCE FROM UNDERGROUND MINING.

The detailed study of mine subsidence was conducted by Thomas Fraser, junior mining engineer, in conjunction with Prof. C. M. Young, of the University of Illinois. Mines were selected in various Illinois coal fields so as to make the work cover mining under as many different conditions as possible. Careful surveys were made above and below ground at given intervals in order to determine the rate of subsidence and the amount of subsidence that might be expected from the removal of a given amount of coal under varying conditions.

ORIGIN AND CONTROL OF MINE FIRES.

During the year J. J. Bourquin, mining engineer, visited a number of mines in the central field that have had trouble with mine fires and took part in sealing off several fires. He has accumulated a great deal of data for a bulletin he is preparing.

COAL-MINE ATMOSPHERES.

Mr. Bourquin spent several weeks in one of the mines of the Vandalia Coal Co. near Sullivan, Ind., collecting the necessary data for completing the bulletin on "Coal Mine Atmospheres" begun by H. I. Smith. Virtually all the data have now been compiled.

OCCURRENCE OF SULPHUR IN COAL.

H. F. Yancey, assistant chemist, studied the physical and chemical properties of pyrite from coal mines in a number of States in order to determine its suitability for sulphuric acid manufacture and also

the feasibility of utilizing coal brasses for this purpose. Mr. Yancey also investigated the forms of sulphur in coals, in order to ascertain how much of the sulphur is in pyritic form and how much in organic form and thus determine the best methods of removing it.

Mr. Yancey, in conjunction with Thomas Fraser, junior mining engineer, studied methods of reducing the sulphur content of Illinois coals in order to suit them for gas and coke manufacture, and the effect of reagents on the rate of oxidation of coal pyrite.

COAL-WASHERY PRACTICE IN THE MIDDLE WEST.

Messrs. Fraser and Yancey visited a number of typical Illinois coal washeries, where they collected samples of both the raw coal and the finished product. By tests with various types of coal-washing jigs and tables they have been able to show that not only the sulphur content of the washed coals but also the loss of coal in the washery refuse may be reduced.

WATER-GAS MANUFACTURE.

W. W. Odell, gas engineer of the bureau, in cooperation with W. A. Dunkley, of the Illinois Geological Survey, investigated current practice at Illinois water-gas plants; made a thorough study, covering several months' experimenting on a commercial basis, at the gas plant at Streator, Ill., and worked out a successful method for the utilization of high-sulphur Illinois coal in place of coke, for making water gas, thereby making possible the use of the Central District coal in place of coke which at the time of the experiments was hard to procure.

The findings of the general survey of the water-gas plants in Illinois were published under the cooperative agreement as Illinois Cooperative Bulletins 21, 22, and 24.[a] Another bulletin on the same subject, "Central District Bituminous Coals as Water-Gas Generator Fuel," has been written for publication by the Bureau of Mines.

ANALYSES OF MINE GASES AND COAL-MINE ATMOSPHERES.

During the year many samples of mine gases and coal-mine atmospheres were analyzed at the Urbana station.

ITHACA OFFICE.

The Ithaca, N. Y., field office worked on two main problems during the fiscal year—electric smelting of low-grade domestic manganese

[a] Dunkley, W. A., and Odell, W. W., The manufacture of retort coal-gas in the Central States using low-sulphur coal from Illinois, Indiana, and western Kentucky: Ill. State Geol. Surv., cooperative mining series, Bull. 21, 1918, 24 pp.; Water-gas manufacture with central district bituminous coals as generator fuel: Ill. State Geol. Surv., cooperative mining series, Bull. 22, 1918, 24 pp.; Water-gas operating methods with central district bituminous coals as generator fuel: Ill. State Geol. Surv., cooperative mining series, Bull. 24, 1919, 27 pp.

ore, and the preparation of special alloy steels for the Army and the Navy.

The work on manganese, briefly described in Bulletin 178–D,[a] showed that it is metallurgically feasible to utilize many low-grade domestic ores, though few, if any, such ores can be economically handled at times of normal prices.

From July 1, 1918, to January 1, 1919, the work on steel was the preparation of a series of special steels requested by the Watertown Arsenal for gun-erosion tests. In this work, as in that on manganese, Prof. H. W. Gillett was assisted by C. E. Williams, assistant metallurgical chemist; Lieut. J. G. Thompson and Lieut. L. S. Deitz, jr., of the Ordnance Department; and Pvt. E. O. Denzler, of the Chemical Warfare Service.

Since January 1, the work on steel has consisted of preparing various special alloy armor-plate steels for test by the Navy. On this work Prof. Gillett was assisted by E. L. Mack, assistant alloy chemist; J. O. Jenkins, ensign; and W. B. Smith, chief gunner's mate, United States Navy; and F. G. Dawson, boilermaker, United States Naval Reserve Force.

The work on steel comprises the making of 50-pound heats of steel by electric-furnace melting—the electric-furnace laboratory equipment of Cornell University being utilized by cooperative agreement—and the analysis of the steels produced. On account of the unusual nature of many of the steels made, the analytical work has included much study of methods of analysis. The work for the Navy is still in progress.

The office also kept in touch, to a limited extent, with the progress of electric-brass melting.

MOSCOW OFFICE.

COOPERATION WITH IDAHO STATE BUREAU OF MINES AND GEOLOGY.

The Idaho Legislature in 1919 established a State bureau of mines and geology in connection with the school of mines at the State University at Moscow and appropriated $15,000 for cooperative work with the Bureau of Mines for the ensuing two years.

During the year, investigations of the treatment of complex lead-zinc sulphide ores and copper-iron sulphide ores with special reference to differential flotation were made at Moscow. Work on antimony ore included sulphidizing followed by flotation.

Before experiments started, each ore was examined under the microscope to determine the relationship of the minerals. This micro-

[a] Manning, Van. H., Explosives and miscellaneous investigations, explosives research, regulation of explosives and platinum, marine-boiler tests, underground sound ranging, training in first aid and rescue work, census of mining engineers and chemists, preparation of alloy steels, lighting aviation fields, cooperation with Capital Issues Committee: Bulletin 178–D, Bureau of Mines, 1919, p. 105.

scopic study included products from screen analyses of crushed ore in order to ascertain the size to which the ore should be crushed to liberate most of the mechanically combined mineral particles.

In the work on differential flotation tests were made to determine the most suitable flotative agents or mixtures—oils, chemicals, and other substances—which would effect a separation of galena from sphalerite or chalcopyrite from pyrrhotite, in order to find the amounts of the specific flotative agents necessary for each ore, and the proper conditions for obtaining maximum commercial recovery of the valuable minerals. Experiments indicate that each ore requires a somewhat different mixture.

FUTURE WORK.

Large-scale flotation tests in the mills in the Coeur d'Alene district are planned, including tests of the regular flotation feed at one or more mills to see if it is not possible to improve the separation of the minerals. The clay deposits of Idaho and the utilization of the Teton Basin coal deposits will also be investigated.

The cooperative staff includes C. A. Wright, metallurgical engineer in charge, and J. T. Norton, ore dressing engineer, Bureau of Mines, and F. A. Thompson, dean, School of Mines, J. H. Jontè, analyst, and J. G. Parmelee, research fellow and assistant metallurgist of the University of Idaho.

SAN FRANCISCO OFFICE.

The office in San Francisco, Calif., which serves as headquarters for engineers of the petroleum division of the bureau detailed to the western fields, is in charge of C. P. Bowie, petroleum engineer. Results of field and laboratory work conducted through this office have already been given under the account of the work of the petroleum division (pp. 708 to 716).

ADMINISTRATION.

FINANCIAL STATEMENT.

The total amount appropriated by Congress for the work of the Bureau of Mines during the fiscal year ended June 30, 1918, was $11,886,510; the disbursements were $3,615,000.

Below is a statement showing the appropriations made and the sum distributed under each appropriation.

Amounts appropriated for and expended by the bureau for the fiscal year ended June 30, 1919.

Title.	Amounts.	Repayments.	Available.	Disbursements.	Balance available subject to vouchers or claims.
General expenses	$73,300.00		$73,300.00	$71,177.85	$2,122.15
Investigating mine accidents	387,219.00	$1,585.56	391,795.56	390,436.83	1,358.73
Testing fuel	135,000.00	1,215.55	136,215.55	134,444.58	1,770.97
Mineral mining investigations	100,000.00		100,000.00	95,022.49	4,977.51
Inspecting mines in Alaska	7,000.00		7,000.00	5,978.77	1,021.23
Books and publications	1,500.00		1,500.00	1,451.04	48.96
Land for mine rescue cars	1,000.00		1,000.00	419.58	580.42
Investigations petroleum and natural gas	100,000.00	7,318.82	107,318.82	107,046.69	272.13
Removal mining experiment station, Pittsburgh, Pa	[a]21,225.00		21,225.00	21,224.47	.53
Care, etc., new buildings, Bureau of Mines, Pittsburgh, Pa	17,220.00		17,220.00	16,773.18	446.82
Fuel storage and distributing yards	432,300.00		432,300.00	431,960.38	339.62
Maintenance and operation fuel yards	1,154,088.00	1,536,216.97	2,690,304.97	1,591,901.28	[b]1,098,403.69
Operating mine rescue cars	136,667.00		136,667.00	97,528.65	39,138.35
Expenses mining experiment stations	150,000.00	912.11	150,912.11	150,630.91	281.20
Improvement of grounds, etc., Pittsburgh and Bruceton, Pa	[a]20,000.00		20,000.00	19,830.52	169.48
War materials investigations	150,000.00		150,000.00	148,807.00	1,193.00
Enforcement of the act to regulate explosives	300,000.00		300,000.00	269,124.80	30,875.20
Expenses act to encourage production, etc., minerals	100,000.00		100,000.00	14,637.72	85,362.28
Adjustment and payment of mineral claims	8,500,000.00		8,500,000.00	43,619.17	[b]8,456,380.83
Lignite coals and peat	100,000.00		100,000.00	2,984.11	[b]97,015.89
Total	11,886,510.00	1,550,249.01	13,436,759.01	3,615,000.02	9,821,758.99

[a] Balance from 1918 available for 1919. [b] Balance available for 1920.

MAILS AND FILES.

Because of the decreased amount of war work in the fiscal year just ended, the amount of mail matter handled at the Washington office during the year decreased somewhat as compared with the previous year, although the bureau is receiving more than twice as much mail as before the war.

PERSONNEL.

On June 30, 1919, there were 785 employees on duty in the Bureau of Mines, 678 of whom held Secretary's appointments, they being distributed and classified as indicated in the following table:

Number of appointees on duty in the Bureau of Mines June 30, 1919.

Location.	Classification and number of appointees.			
	Technical.	Clerical.	Non-clerical.	Total.
Washington	*a* 49	138	*b* 60	247
Pittsburgh	*c* 113	35	*d* 81	229
Field in general	*e* 135	51	16	202
Total	297	224	157	678

a Engineers, 20; chemists, 9; miscellaneous, 20.
b Includes such employees as chauffeur, mechanic, watchman, messenger, laborer.
c Engineers, 42; chemists, 39; miscellaneous, 32.
d Includes such employees as fireman, watchman, oiler, carpenter, shot-firer, janitor, machinist's helper laborer.
e Engineers, 42; chemists, 23; miscellaneous, 70.

In addition to the employees enumerated in the table, there were 66 unskilled laborers and other miscellaneous employees, including cooks, employed on field agreement, 29 of whom were in Pittsburgh and 37 in the field in general, and 41 explosives inspectors employed in connection with explosives regulation work, or a total of 785 employees on duty June 30, 1919—an increase of 137 appointees and a decrease of 9 on field agreements, as compared with the preceding fiscal year.

The total number of changes in status requiring the approval of the Secretary of the Interior, and consisting of appointments, reinstatements, transfers, promotions, reductions, separations, extensions of limited appointments, etc., was 1,667. The number of changes in status on field agreements issued by the director with the approval of the Secretary of the Interior, and including employments, separations, promotions, extensions, and reductions, etc., was 1,148, a total of 2,815 in all, an increase of 691 over the preceding fiscal year, and in connection with the various status changes listed, a total of 2,457 miscellaneous letters and other general correspondence incident to personnel work were necessary.

The personnel of the bureau at the close of June 30 was increased by the issuance of 58 appointments under section 5 of the war minerals relief act, approved March 3, 1919, for the adjustment and payment of mineral claims.

LIBRARY.

The main library of the bureau is in the Interior Building in Washington. There are branch libraries at the 13 experiment sta-

tions—Columbus, Ohio, Pittsburgh, Pa., Ithaca, N. Y., Minneapolis, Minn., Urbana, Ill., Bartlesville, Okla., Golden, Colo., Salt Lake City, Utah, Tucson, Ariz., Seattle, Wash., San Francisco, Calif., Berkeley, Calif., and Fairbanks, Alaska.

All books are interchangeable between the stations. Through interlibrary loans 688 volumes were borrowed and returned; through purchase, exchange, and binding, 598 volumes were added to the library during the year. Eight hundred and seventy-eight volumes, including those for the branch libraries, were sent to the bindery. The library now contains about 16,000 volumes.

PUBLICATIONS.

The Bureau of Mines publishes bulletins, technical papers, miners' circulars, a monthly statement of fatalities in coal mines, the annual report of the director, and miscellaneous publications, such as handbooks on special subjects, posters, charts, lists, and schedules.

The bulletins include those reports that present in detail the results of technical and scientific investigations; they are of interest chiefly to engineers, chemists, mine officials, and other persons familiar with the subjects discussed. The technical papers are shorter and less formal than the bulletins, and contain preliminary notices of the results or the progress of detailed investigations, or describe small incidental investigations. The miners' circulars deal with such practical matters as accident prevention, rescue and first-aid methods, the safe-guarding of health, and other topics that directly concern the workers in mines, mills, and metallurgical plants. The circulars are written in simple, nontechnical English, and are printed in much larger editions than are the bulletins and technical papers. One of the circulars, that on first aid for miners, is printed in Italian, Polish, and Slovak, with the English translation on opposite pages.

The bulletins and technical papers issued during the fiscal year ended June 30, 1919, are summarized in the following statement:

Bulletins:

Bulletin 123. Analyses of Mine and Car Samples of Coal Collected in the Fiscal Years 1913 to 1916, by Arno C. Fieldner, H. I. Smith, J. W. Paul, and Samuel Sanford. 1917. 456 pp.

Bulletin 127. Gold Dredging in the United States, by Charles Janin. 1918. 224 pp., 63 pls., 23 figs.

Bulletin 129. The Fusibility of Coal Ash and the Determination of the Softening Temperature, by A. C. Fieldner, A. E. Hall, and A. L. Field. 1918. 146 pp., 4 pls., 9 figs.

Bulletin 144. Report of a Joint Committee Appointed from the Bureau of Mines and the U. S. Geological Survey by the Secretary of the Interior to Study the Gold Situation, October 30, 1918. 84 pp., 1 pl., 3 figs.

Bulletin 150. Electrodeposition of Gold and Silver from Cyanide Solution, by S. B. Christy. 1919. 171 pp., 8 pls., 41 figs.

Bulletin 154. Mining and Milling of Lead and Zinc Ores in the Missouri-Kansas-Oklahoma Zinc District, by C. A. Wright and H. A. Buehler. 1918. 134 pp., 17 pls., 13 figs.

Bulletin 156. The Diesel Engine: Its Fuels and Its Uses, by Herbert Haas. 1918. 130 pp., 16 pls., 57 figs.

Bulletin 157. Innovations in the Metallurgy of Lead, by D. A. Lyon and O. C. Ralston. 1918. 167 pp. 13 figs.

Bulletin 160. Rock Quarrying for Cement Manufacture, by Oliver Bowles. 1918. 160 pp., 6 pls., 31 figs.

Bulletin 161. California Mining Statutes Annotated, by J. W. Thompson. 1918. 312 pp.

Bulletin 163. Method of Shutting Off Water in Oil and Gas Wells, by F. B. Tough. 1918. 122 pp., 20 pls., 7 figs.

Bulletin 165. Bibliography of Petroleum and Allied Substances in 1916, by E. H. Burroughs. 1919. 159 pp.

Bulletin 166. A Preliminary Report on the Mining Districts of Idaho, by Thomas Varley, Clarence A. Wright, Edgar K. Soper, and Douglas C. Livingston. 1919. 113 pp., 3 pls., 3 figs.

Bulletin 168. Recovery of Zinc from Low-Grade and Complex Ores, by D. A. Lyon and O. C. Ralston. 1919. 145 pp., 23 figs.

Bulletin 169. Illinois Mining Statutes Annotated, by J. W. Thompson. 1918. 594 pp., 35 cents.

Bulletin 170. Extinguishing and preventing oil and gas fires, by C. P. Bowie. 1918. 50 pp., 19 pls., 4 figs.

Bulletin 171. Melting Brass in a Rocking Electric Furnace, by H. W. Gillett and A. E. Rhoads. 1918. 131 pp., 4 pls., 1 fig.

Bulletin 172. Abstracts of Current Decisions on Mines and Mining, Reported from January to May, 1918, by J. W. Thompson. 1919. 160 pp.

Bulletin 174. Abstracts of Current Decisions on Mines and Mining, Reported from May to September, 1918, by J. W. Thompson. 1919. 138 pp.

Bulletin 176. Recent Developments in the Absorption Process for Recovering Gasoline from Natural Gas, by W. P. Dykema. 1919. 90 pp., 20 pls., 30 figs.

Bulletin 177. The Decline and Ultimate Production of Oil Wells, with Notes on the Valuation of Oil Properties, by C. H. Beal. 1919. 215 pp., 4 pls., 80 figs.

Bulletin 179. Abstracts of Current Decisions on Mines and Mining, Reported from September to December, 1918, by J. W. Thompson. 1919. 166 pp.

Technical Papers.

Technical Paper 96. Fume and Other Losses in Condensing Quicksilver from Furnace Gases, by L. H. Duschak and C. N. Schuette. 1918. 29 pp., 4 figs.

Technical Paper 139. Low-Rate Combustion in Fuel Beds of Hand-Fired Furnaces, by Henry Kresinger, C. E. Augustine, and S. H. Katz. 1918. 52 pp., 19 figs.

Technical Paper 152. The Inflammability of Aluminum Dust, by Alan Leighton. 1918. 15 pp.

Technical Paper 154. Suggestions for Improved Methods of Mining Coal on Indians Lands in Oklahoma, by J. J. Rutledge and Daniel Harrington. 1918. 32 pp., 8 pls., 4 figs.

Technical Paper 171. Method of Least Squares Applied to Estimating Errors in Coal Analysis, by J. D. Davis and J. G. Fairchild. 1918. 36 pp., 1 pl., 5 figs.

Technical Paper 178. Notes on Lignite, Its Characteristics and Utilization, by S. M. Darling. 1919. 18 pp.

Technical Paper 186. Methods for Routine Work in the Explosive and Physical Laboratory of the Bureau of Mines, by S. P. Howell and J. E. Tiffany. 1918. 631 pp.

Technical Paper 190. Methane Accumulations from Interrupted Ventilation, with Special Reference to Coal Mines in Illinois and Indiana, by N. I. Smith and R. J. Hamon. 1918. 46 pp., 2 pls., 5 figs.

Technical Paper 191. Central Station Heating, Its Economic Features, with Reference to Community Service, by John C. White. 1918. 23 pp., 6 figs.

Technical Paper 192. Production of Explosives in the United States During the Calendar Year 1917, with Notes on Coal Mine Accidents Due to Explosives and List of Permissible Explosives, Lamps, and Motors Tested Prior to March 31, 1918, compiled by A. H. Fay. 1918. 21 pp.

Technical Paper 196. Notes on the Black Sand Deposits of Southern Oregon and Northern California, by R. R. Hornor. 1918. 40 pp., 8 pls.

Technical Paper 197. Use of the Hydrogen-Volatile Matter Ratio in Obtaining the Net Heating Value of American Coals, by A. C. Fieldner and W. A. Selvig. 1918. 13 pp., 4 figs.

Technical Paper 198. Sulphur Dioxide Method for Determining Copper Minerals in Partly Oxidized Ores, by C. E. Van Barneveld and E. S. Leaver. 1918. 12 pp., 1 fig.

Technical Paper 200. Colloids and Flotation, by F. G. Moses, 1918. 24 pp.

Technical Paper 203. Labor Saving at Limestone Quarries, by Oliver Bowles. 1919. 26 pp.

Technical Paper 205. Saving Coal in Boiler Plants, by Henry Kreisinger. 1918. 24 pp., 3 figs.

Technical Paper 206. Coke-oven Accidents in the United States, During the Calendar Year 1917, compiled by A. H. Fay. 1918. 19 pp.

Technical Paper 207. Combustion Experiments with North Dakota Lignite, by Henry Kreisinger, C. E. Augustine, and W. C. Harpster. 1919. 44 pp., 1 pl., 13 figs.

Technical Paper 208. How to Improve the Hot-Air Furnace, by C. W. Baker. 1918. 19 pp.

Technical Paper 209. Traps for Saving Gas at Oil Wells, by W. R. Hamilton. 1919. 34 pp., 3 pls., 16 figs.

Technical Paper 212. The Determination of Combustible Matter in Silcate and Carbonate Rocks, by A. C. Fieldner, W. A. Selvig, and G. G. Taylor. 1919. 22 pp., 1 fig.

Technical Paper 213. Quarry Accidents in the United States During the Calendar Year 1917, compiled by A. H. Fay. 1919. 62 pp.

Technical Paper 214. Motor Gasoline Properties, Laboratory Methods of Testing, and Practical Specifications, by E. W. Dean. 1919. 33 pp., 2 figs.

Technical Paper 215. Accidents at Metallurgical Works in the United States During the Calendar Year 1917, compiled by A. H. Fay. 1919. 23 pp.

Technical Paper 216. Vitiation of Garage Air by Automobile Exhaust Gases, by G. A. Burrell and A. W. Gauger, 1919. 12 pp.

Technical Paper 217. Saving Coal in Steam Power Plants, prepared by the United States Fuel Administration. 1919. 8 pp.

Technical Paper 218. Boiler Water Treatment, prepared by the United States Fuel Administration. 1919. 8 pp.

Technical Paper 219. Combustion and Flue Gas Analysis, prepared by the United States Fuel Administration. 1919. 12 pp.

Technical Paper 220. Burning Steam Sizes of Anthracite With or Without Admixture of Soft Coal, prepared by the United States Fuel Administration. 1919. 8 pp.

Technical Paper 221. Saving Steam in Industrial Heating Systems, prepared by the United States Fuel Administration. 1919. 14 pp.

Technical Paper 222. Method of Administering Leases of Iron-Ore Deposists Belonging to the State of Minnesota, by J. R. Finlay. 1919. 40 pp., 1 fig.

Technical Paper 223. Cost Keeping for Small Metal Mines, by J. C. Pickering. 1919. 46 pp.

Technical Paper 224. Metal-Mine Accidents in the United States during the Calendar Year 1917, With Supplemental Labor and Accident Tables for the Years 1911 to 1917, Inclusive, compiled by A. H. Fay. 1919. 80 pp.

There were 36 papers in course of publication, also 7 reprints of papers in course of publication at the end of the fiscal year. During the year 22 bulletins, 33 technical papers, 1 miners' circular, and 17 other publications were printed, as follows:

Coal-mine fatalities	13
Annual Report of the Director	1
Handbooks	1
List of Publications	1
Schedules	1

There were 19 reprints published—8 bulletins, 6 technical papers, 2 miners' circulars and 4 other publications.

EDITORIAL WORK.

In spite of the bureau giving attention during the preceding year chiefly to war work investigations that were not described in detail for publication, the number of reports printed exceeded that of any prior year.

During the year 22 bulletins, 33 technical papers, 1 miners' circular and 16 other publications were issued. The bulletins and technical papers were as follows: Bulletins 123, 127, 129, 144, 150, 154, 156, 157, 160, 161, 163, 165, 166, 168, 169, 170, 171, 172, 174, 176, 177, 179; Technical Papers 96, 139, 152, 154, 171, 178, 186, 190, 191, 192, 196, 197, 198, 200, 203, 205, 206, 207, 208, 209, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224. The contents of the bulletins and technical papers have been summarized in the preceding statement.

The other publications included the annual report of the director, 12 monthly statements of coal-mine fatalities in the United States, a handbook on rescue and recovery work in mines and another on economy in the use of fuel oil, lists of publications, and a schedule of tests of permissible explosives.

Eight bulletins, 6 technical papers and 2 miners' circulars and 4 other publications were reprinted in one or more editions. In addition to the work done on the publications enumerated the text of 25 other publications was edited, and illustrations for these were prepared for engraving.

The editorial work was in charge of S. Sanford, engineer.

DISTRIBUTION OF PUBLICATIONS.

The Bureau of Mines during the fiscal year 1919 distributed in all 590,954 copies of publications, as follows: Bulletins, 92,485; technical papers, 170,036; miners' circulars, 235,289; annual reports, 2,502; miscellaneous documents, 90,642.

The number of copies of bulletins, technical papers and miners' circulars distributed was larger than in the fiscal year 1918 by 62,522.

The number of letters of inquiry received reached the high total of 97,775, or 20,708 more than the former fiscal year, and 30,995 more than in 1914. This is the maximum number of letters of inquiry received in a year by the Bureau of Mines since its organization. The gain signifies that the work of the Bureau of Mines is expanding, and that its efforts to acquaint the public with its investigations are increasingly successful.

The work of the section continued in charge of J. L. Cochrane, statistician.

REPORT OF THE ST. ELIZABETHS HOSPITAL

OFFICERS OF THE HOSPITAL.

BOARD OF VISITORS.

Rear Admiral WILLIAM C. BRAISTED, Surgeon General, U. S. N., President of the Board.

Brig. Gen. WILLIAM C. GORGAS, Surgeon General, U. S. A., President of the Board.[1]

Mr. LEWIS E. SMOOT.

Mrs. ARCHIBALD HOPKINS.

WALTER S. HARBAN, D. D. S.

RUPERT BLUE, M. D., Surgeon General, P. H. S.

Mr. GILBERT H. GROSVENOR.[1]

Mr. G. L. NICOLSON.

Executive Committee of the Board.

Dr. BLUE.

Mr. SMOOT.

Chaplains.

Rev. C. H. BUTLER.

Rev. W. G. DAVENPORT.

Rev. JOHN E. HORSTKAMP.

Rev. HUGH T. STEVENSON.

Rev. GEO. M. CUMMINGS.

MEDICAL STAFF.

Superintendent.

WILLIAM A. WHITE, M. D.

First Assistant Physician.

JAMES C. HASSALL, M. D.

Clinical Directors.

MARY O'MALLEY, M. D.

JOHN E. LIND, M. D.

Scientific Director.

S. I. FRANZ, A. B., Ph. D., LL. D., M. D.

Pathologist.

NOLAN D. C. LEWIS, M. D.

Clinical Psychiatrist.

EDWARD J. KEMPF, M. D.

Assistant Clinical Psychiatrists.

EDWARD WM. LAZELL, M. D.

LUCILE DOOLEY, Ph. D.

Senior Assistant Physicians.

JOHN P. H. MURPHY, M. D.

JOHN A. PFEIFFER, M. D.[1]

SAMUEL A. SILK, M. D.

ARRAH B. EVARTS, M. D.[1]

MILDRED E. SCHEETZ, M. D.

LEON E. DUVAL, M. D.[1]

Assistant Physicians.

HAGOP DAVIDIAN, M. D.

HERMAN P. HYDER, M. D.

ELSA B. WILL, M. D.

Junior Assistant Physicians.

HELEN D. KEMPF, M. D.

ELMER B. M. CASEY, M. D.[1]

Medical Internes.

GERTRUDE R. DAVIES, M. D. ELEANOR B. SAUNDERS, M. D.
INA L. MOORE, M. D.[1]

Military Assignments.

From the Navy. From the Army.

DALLAS G. SUTTON, M. D., Surgeon, U. S. N. S. L. CHAPPELL, Lt. Col., M. C., U. S. A.

Visiting Dentist.

A. D. WEAKLEY, D. D. S.

Resident Dentist.

ADOLPH JACOBS, D. D. S.[1]

Dental Interne.

SAMUEL BOGDONOFF, D. D. S.

Visiting Ophthalmologist.

CHARLES L. BILLARD, M. D.

Veterinarian.

C. E. DORNHEIM, V. D. M.

Steward.

MONIE SANGER.

Disbursing Agent.

GEO. W. KREIS.

Chief Clerk.

FRANK M. FINOTTI.

Purchasing Agent.

A. E. OFFUTT.

Matron.

H. O'BRIEN.

Chief of Training School.

MISS ALICE VAUGHN.

CONSULTING STAFF.

Internal Medicine.

Dr. S. S. ADAMS. Dr. STERLING RUFFIN.
Dr. G. W. COOK. Dr. JAMES D. MORGAN.

General Surgery.

Dr. L. H. TAYLOR. Dr. CHAS. S. WHITE.
Dr. G. T. VAUGHAN. Dr. JAMES F. MITCHELL.
Dr. W. P. CARR.

Consulting Alienist.

Dr. D. PERCY HICKLING.

Gynæcology.

Dr. JOSEPH TABER JOHNSON. Dr. I. S. STONE.
Dr. J. W. BOVEÉ.

Ophthalmology.

Dr. D. K. SHUTE. Dr. W. K. BUTLER.

Laryngology.

Dr. C. W. RICHARDSON. Dr. W. A. WELLS.
Dr. J. J. RICHARDSON. Dr. F. T. CHAMBERLAIN.

Medical Zoology.

Dr. C. W. STILES. Dr. THOMAS A. CLAYTOR.

Dermatology.

Dr. RANDOLPH BRYAN CARMICHAEL. Dr. H. H. HAZEN.

[1] Resigned.

REPORT OF THE ST. ELIZABETHS HOSPITAL.

WASHINGTON, D. C., *July 1, 1919.*

SIR: The board of visitors for St. Elizabeths Hospital have the honor to submit the sixty-fourth annual report of the hospital, consisting of the report of the superintendent for the fiscal year ended June 30, 1919, and his recommendations.

Respectfully,

WM. C. BRAISTED,
President of the Board of Visitors.
WM. A. WHITE, M. D.,
Superintendent, Secretary of the Board Ex Officio.

REPORT OF THE SUPERINTENDENT.

MOVEMENTS OF POPULATION.

On June 30, 1919, there were remaining in the hospital 3,586 patients, as against 3,375 remaining June 30, 1918, an increase of 211 over the previous year. There were admitted during the year 1,802. The largest number of admissions to the hospital in any one year previous to this was 1,054. The total number of patients treated during the year was 5,177. The number of discharges, including deaths, was 1,591. The daily average population was 3,638, as against 3,330 for the year 1917–18, an increase of 308.

Movement of population, fiscal year ended June 30, 1919.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Remaining June 30, 1918	2,108	416	536	315	3,375
Admitted during year 1918–19	1,365	184	175	78	1,802
Total number under treatment during year ending June 30, 1919	3,473	600	711	393	5,177
Discharged:					
Recovered	373	33	34	12	452
Improved	247	14	29	10	300
Unimproved	134	23	28	10	195
Not insane	125	7	8	3	143
Died	333	63	70	35	501
Total discharged and died	1,212	140	169	70	1,591
Remaining June 30, 1919	2,261	460	542	323	3,586

ADMINISTRATIVE DEPARTMENT.

OFFICE OF STEWARD.

FARM AND GARDEN PRODUCTS.

Fruits and vegetables raised during the year ended June 30, 1919.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Apples:			Kale, barrels	470 18/20	$941.75
Crab, bushels	60	$90.00	Lettuce, heads	14,135	706.75
Green, barrels	175	875.00	Milk, gallons	172,601	58,684.34
Beans:			Onions, green, bunches	30,197	905.91
Lima, bushels	129 7/10	641.25	Oyster plant, do	5,475	249.75
String, barrels	126 1/2	680.25	Parsley, do	14,900	447.00
Beets, bunches	4,687	195.01	Parsnips, do	51	153.00
Cabbage, barrels	296 8/10	769.20	Pears, bushels	243 1/2	487.00
Cabbage sprouts, bunches	73	219.00	Peas, green, do	133 3/4	133.75
Canteloupes, single	7,109	710.90	Peppers, green, do	145	290.00
Carrots, bunches	17,650	529.50	Pork, fresh, pounds	20,726	6,217.80
Cauliflower, heads	485	62.25	Plums, bushels	8	16.00
Celery, bunches	3,848	192.40	Potatoes, sweet, do	262	524.00
Cherries, quarts	680	181.00	Potatoes, Irish, pounds	59,080	2,067.80
Chicken, pounds	333	124.61	Pumpkins, single	3,370	505.50
Corn, green, ears	6,032	120.64	Radishes, bunches	13,972	419.16
Cucumbers, single	4,414	88.28	Spinach, barrels	33	65.00
Currants, quarts	100	20.00	Squash, summer, single	25,682	1,284.10
Eggs, dozen	5,454 1/2	2,543.38	Tomatoes, green, bushels	1,086 7/8	3,134.37
Eggplant, single	4,398	219.90	Turnips, do	403 1/2	302.63
Figs, bushels	3/4	1.12	Watermelons, single	495	123.75
Grapes, pounds	10,720	642.30	Total		88,565.35

Forage and feed raised on farm during the year ended June 30, 1919.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Corn:			Oats, tons	56	$560.00
Ear, barrels	59	$590.00	Wheat, do	109	1,090.00
Shelled, bushels	333	666.00	Straw, rye, do	14	140.00
Corn fodder, tons	603	6,030.00	Beets for cows, bushels	14	42.00
Hay, green:			Total		15,598.00
Corn, tons	526	5,260.00			
Cow peas, do	122	1,220.00			

ARTICLES MANUFACTURED.

Work of sewing and mending rooms during the year ended June 30, 1919.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Aprons:			Cornerpieces	3	$2.74
Cooks'	60	$18.42	Coats:		
Boys', gingham	33	27.72	Citizens'	1,054	1,960.26
Barber	2	.62	Dairy	48	40.80
Dining room	220	79.20	Overall	643	1,266.71
White	799	335.45	Covers:		
Gingham	182		Billiard table	1	1.56
Rubber	9	3.76	Rubber pillow	1	.90
Bags:			Bureau	86	43.00
Clothes	9	4.41	Car	173	125.87
Jelly	7	2.16	Couch, B. L	12	34.44
Sand	6	.90	Swiss	10	3.30
Laundry	4	7.20	Cushion, B. L	7	10.92
Blouses	124	1,009.36	Piano	2	1.64
Caps:			Screen	138	77.91
Dairy	52	8.84	Do	162	84.24
Rubber	53	40.81	Sideboard	42	66.36
Cases, pillow	7,172	2,465.27	Screen, B. L	3	1.56
Centerpieces	1	.18	Stand	1,466	612.22
Chemises	1,063	696.07	Table, B. L	3	4.68
Cloths:			Curtains:		
Table, long	298	1,868.36	Cotton, sash	26	16.38
Table, short	286	1,049.99	Cotton, sash, long	6	3.78

Work of sewing and mending rooms during the year ended June 30, 1919—Contd.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Curtains—Continued.			Sheets:		
Cotton, sash, Swiss	4	$0.96	Double	213	$400.44
Rubber	2	14.92	Single	11,915	16,581.00
Disrobing room	11	30.36	Shirts:		
Swiss	1	.72	Canton flannel	2,634	3,977.34
Drawers:			Check	3,545	4,714.85
Boys', C. F	603	709.29	Night	1,202	1,478.46
C. F	2,516	3,265.90	Percale	.....	.....
M. C	5	4.75	Boys' canton flannel	16	17.44
W. C	548	274.00	Shoes, men's home-made	42	147.00
Dresses:			Skirts:		
Light gingham	30	68.70	Gingham	.....	.....
Stout gingham	1,254	2,944.36	Denim	.....	.....
Night, long	362	491.40	Strainers, linen	49	33.83
Night, short	517	494.78	Suits, canvas	16	61.60
Percale	518	926.10	Ticks:		
Gowns:			Mattress, double	14	58.52
Nurses'	15	24.90	Mattress, single	1,386	2,930.78
Surgeons'	4	4.00	Pillow	1,278	664.76
Hose, W. C	43	6.63	Towels:		
Mats, drawn	34	42.50	Barnsley	2,983	508.89
Pants:			Bath	5,722	1,459.98
Citizens'	1,358	2,289.34	Tea	2,566	501.05
Dairy	60	51.00	Tubs, canvas baths	1	9.19
Overall	1,212	2,036.16	Underhandkerchiefs	758	841.31
Soldiers'	227	809.12	Waists, boys' gingham	12	10.08
Petticoats	999	783.07	Waists, boys' percale	3	2.52
Sacs, dressing	2	1.78	Total	.....	62,405.98

REPAIRS AND MISCELLANEOUS WORK.

Aprons, made	36	$2.16	Miscellaneous repair	30,892	$1,235.68
Blankets, hemmed	3,311	132.44	Bed pads	105	4.20
Drawers, made	1	.16	Trousers cleaned	9	.45
Gloves, made	135	5.40	Laundry nets made	164	6.56
Dresses, made	8	7.60	Overcoats pressed	1	.30
Names, sewed on	11,030	34.85			
Napkins, hemmed	2,417	96.68	Total	.....	1,554.38
Suits, cleaned and pressed	93	27.90			

Articles made in the bakery during the year ended June 30, 1919.

Articles.	Quantity.	Value.
Bread, loaves	1,430,944	$61,816.78
Rolls, single	308,840	2,753.09
Pastry, pounds	42,833	5,234.39
Total	.....	69,804.26

Work done in laundry during year ended June 30, 1919.

Articles.	Quantity.	Value.
Number of pieces:		
Washed	3,871,392	$16,812.29
Dried	1,416,716	6,986.53
Mangled	2,424,148	3,635.74
Ironed	336,876	8,191.60
Total	.....	36,626.16

Articles made in Howard Hall workroom during the year ended June 30, 1919.

	Quantity.
Brooms	2,610
Brooms, whisk	72
Hats, straw	362

Articles made in brush shop during year ended June 30, 1919.

Brushes:	
Dust	216
Hair	180
Scrub	780
Sweeping	264

Work done in mattress shop during year ended June 30, 1919.

Mats:	
Drawn	103
Mattresses made and made over:	
Hair, single	1,842
Hair, double	17
Straw	10
Pillows made and made over:	
Hair	1,743
Feather	8
Hair, old, renovated	16,700

Articles made in shoe shop during year ended June 30, 1919.

Shoes, men's	78

Canned fruits and vegetables, preserves, jellies, etc., prepared in hospital kitchen during year ended June 30, 1919.

	Quarts.		Quarts.
Apples, canned	24	Jelley, blackberry	5½
Beans:		Apple	736
Lima	14	Currant	13¾
String	6	Juice, grape ——bottles	27
Beets, pickled	62	Pears:	
Blackberries, canned	32	Canned	24
Catsup ——bottles	946	Pickled	363
Cherries, canned	158	Preserved	1,266
Chili sauce	581	Picallili	78
Figs	7	Plums, preserved	124
Jam, grape	456	Tomatoes, preserved	236
Jelly, grape	731	Watermelon, pickled	56

Semipermanent buildings.—The semipermanent buildings which were authorized by Congress October 6, 1917, at a cost not exceeding $200,000, consisting of seven ward buildings, one dining hall, and kitchen building, were erected by the Oscawana Building Co. on their bid of $156,700. These buildings were completed and are partly occupied. They have accommodations for approximately 500 patients, with a congregated dining room to seat all the patients in these buildings and with a kitchen that, with slight additions, is large enough to provide meals for from 800 to 1,000 patients. The ward buildings are one story in height, finished with stucco, of either slow-burning or fireproof construction, having ample facilities for vacating in case of emergency. The plans of these buildings were submitted to construction experts, who gave it as their opinion that,

with some change in the roof, it would have a life of approximately 30 years. Since having been erected, we have had many visitors of practical hospital experience, and their opinions have been universally that the building utilized in this construction was ideal for the purpose for which they were built. The plan of the building permitted a division into two dormitories divided by a center corridor connecting the various buildings. A small office for the nurses or attendants inclosed by a partition with windows is located in such a manner that a full view may be had of the whole ward. Between each building there is a day room to be occupied by the patients while not in bed. These two rooms are fitted up with rugs, tables, and chairs, and the patients are furnished with magazines and books. The hospital has been the recipient of victrolas and music boxes to amuse the patients while in the day rooms. On the opposite side of the corridor from the day room, between the ward buildings, are the water sections. These sections consist of shower baths, lavatories, and closet arrangements. Storage facilities are given for wearing apparel of patients, bed linen, and tableware. The corridor has a floor covered with linoleum, which covers the entire corridor from wall to wall. The dining room has ample facilities to feed all the patients in this group, but as many of the patients are confined to bed, their meals are brought to them, food carriages being used for this purpose. The kitchen has ample capacity not only to feed all patients in this group, but is large enough to take care of additional equipment to feed an equal number of patients, if another group of equal size was added. It is finished with all modern equipment of a hospital kitchen, including coal ranges, electric bake ovens, aluminum and other steel kettles, bread cutters and similar utensils, which make it possible to furnish the food in good condition and minimize the labor that is attached to the providing of same. The ground around these buildings has been graded, a system of walks installed, and it is expected to put in a few flower pots in various locations around these buildings. Settees are constructed and placed adjacent to these buildings, so that the patient while on parole has the benefit of the lawns.

Shop and storehouse building.—Work on the new shop and storehouse building, now under construction to the north of the Howard Hall building, was temporarily suspended, due to the impossibility of getting proper workmen during the period of the war for any salaries within reason which we could pay to complete this work. During the past month work has again been started, and we hope to complete it during the next few months and occupy it with the various mechanical departments, shops, and storehouses. Most of the work on this building is done by patients under the supervision of employees.

Coal storage.—The rear switch of the coal-storage pocket is not as yet complete. This is another one of the projects that we were compelled temporarily to abandon during the war on account of lack of necessary labor. We have about one-fourth of this work yet to be done, and hope to complete it during this year. At the present time we are contemplating the installation of the track scale authorized by Congress, and it may be advisable to locate this scale on the track as it enters over the coal pocket. As soon as the location of the scale is decided and the contract completed, the balance of the work upon the track over the coal pocket will be rushed to completion.

Track scale.—A contract has been awarded for the track scale authorized by Congress, and we will await delivery of the scale and the structural steel work preliminary to putting in a foundation, this part of the work being done by the hospital.

Fence.—An additional fence has been purchased to continue the fencing in the hospital grounds to the east of Nichols Avenue. Two hundred and twenty-five feet of this fence is of the same character as that just erected, and will be used to extend a short distance to the east on the north corner of the hospital grounds in order to give a finished appearance and adequate protection to the grounds. Eight hundred feet of fence of a different character will be erected in continuance of the fence installed on the south side continuing east toward the cemetery. This will practically encircle the hospital ground within a view of the hospital cemetery. We hope at some future time to be able to purchase the additional fence needed adjacent to the cemetery.

Sewerage.—The additional buildings constructed on hospital reservation to the east of Nichols Avenue overtaxed our present sewerage arrangement. A careful investigation demonstrated that it was essential in using these buildings to have additional sewerage facilities. The sewerage in the part of the grounds to the east of Nichols Avenue unfortunately when installed was not a sufficient depth to adequately drain the buildings located in this section of the grounds. We were continually having trouble on account of lack of proper drainage and our inability to put catch basins and toilet necessities in basement of building, due to the impossibility of getting sewerage. A contract was entered into authorizing the construction of a sewer draining this whole ground, connecting up with the new buildings, to be carried under Nichols Avenue to the hospital land on the west of said avenue, said connections being made in this ground, draining buildings C, M, Q, and female nurses' home, to be carried down the ravine between Q and Toner Building into the district's outlet sewer. This work has been completed and the same is now in use. We have not only been able to use this sewer for the new buildings erected but have been able to install additional closets in the basements of the various build-

ings within the drainage area of this sewer for the use of the employees.

New boiler.—The semipermanent buildings increased to a great extent the heating service that our boiler plant must take care of. As a point of safety, it was thought advisable to provide at least one additional boiler for heating, lighting, and other purposes. Out of the $200,000 authorized by Congress, a contract was entered into with a local firm to furnish this hospital with one 300-horsepower Heine boiler equipped with automatic stoking devices for firing. This boiler, together with an automatic stoker, of the same type as those already in service in the power house, has been installed and is at present awaiting practical and technical tests before final acceptance. The engineers of the Bureau of Mines have recently visited the hospital and made arrangements for running these tests under the basis of efficiency from various standpoints. When this boiler is accepted the hospital will have twelve 300-horsepower automatic stokers with automatic ash-handling attachment, large coal bunkers, automatically feeding the coal, weighing same before passing the coal to the fire box, drawing the ashes into a pit under the furnace, and blowing them through a pipe into a large tank outside the power house, whence they are carried to the ash dump.

Cleaning boiler tubes.—On account of the lack of labor, the hospital was unable to clean all the boilers during the summer of 1918, but were compelled to enter into a contract and have six of these boilers cleaned. Many of our mechanics have not reported back for duty. We are at present overhauling our boilers, cleaning the tubes, and putting them all in first-class shape. We have cleaned the tubes in the first boilers in the old section of the power house, resetting the brick walls, and are now at work carefully going over the boilers in the new section of this building.

Locomotive.—Our locomotive gave us a great deal of trouble during the past year. Fire box showed signs of wear and tear, leaking continuously. This leak seemed to be on the increase and the efficiency of the locomotive decreased. We requested bids of the local boiler makers to repair this locomotive. We could find no one that would undertake the work of repairing this locomotive on account of the shortage of workmen to make the necessary repairs. We communicated with the master mechanic of the Baltimore & Ohio Railroad shops, they loaning us one of theirs while ours was being repaired. They gave the locomotive a thorough overhauling and returned it within six months. The hospital paid the Baltimore & Ohio Railroad for this work and also the rental value of their locomotive while we used it.

Railroad.—Lack of labor prevented us from keeping our railroad track in repair, and it was necessary in this case to ask the assistance

of the Federal Railroad Administration for their help in keeping the railroad track in proper repair. They ordered the Baltimore & Ohio Railroad officials to give us all the assistance necessary in going over the track and keeping it in proper shape. The Baltimore & Ohio Railroad through their officials have on several occasions made repairs on our track and roadbed, putting in several hundred railroad ties and additional rails. The larger and heavier coal cars now in use will require a thorough overhauling of our track and replacement of the rails, which weigh 60 pounds to a yard, the larger and heavier rails weighing 80 pounds to a yard. On two occasions during the past year these heavier cars split our rails, plunging off the track and tearing up the roadbed. Each time it requires a good deal of our time to make necessary repairs and to replace these rails by the heavier ones, such as explained in the foregoing part of this paragraph. The heavy rains during the spring caused a washout under the track at a compound curve just below the power house. This was a dangerous place and required the use of several thousand yards of ashes to fill in the hole that was left by this washout and prevent the railroad track being in such condition that it would be impossible to have used it for traffic. Temporary repairs have been made and the track is now in use.

Water.—Our wells were overhauled during the summer of 1916 and kept in good shape during the past winter. During this spring the large increase in the use of the water proved to be a severe drain and caused a shortage of water during the month of June. These wells are now being overhauled and cleaned out. We believe this will relieve the shortage of water at once. The large main connecting the wells with the pumps and reservoirs sprang a leak through the breaking of the pipe and it became necessary to make repairs and to put in several new sections of pipe. While these repairs were being made we communicated with the District water department and arranged to open the valves for their mains and utilize water furnished by the District of Columbia. The pipe line has been extended from our reservoir to the aviation camp of the Army located on Bolling Field, and an additional extension from the Army aviation camp to the hydroplane camp of the Navy located on the water's edge of this same field. We have been furnishing water to these places of the Army and Navy during all the past year, as it was the only manner in which they could secure an adequate supply of good drinking water for use.

Godding Croft water supply.—The water supply at Godding Croft proved to be insufficient for our needs at this place. A careful survey demonstrated that the only solution to this problem was to sink a new well. A new well has been sunk under contract, and a 24-hour test given under the supervision of the hospital engineer proved this

well to have an adequate supply for all needs. The hospital is now drawing plans to provide a pump, engine, and tanks to be erected in connection with this well.

Steam and heat.—Steam mains were installed to supply the semi-permanent buildings with steam for cooking and heating; also to furnish hot water for the kettles, urns, and dish-washing machines. Additional radiation was supplied to Burrough's cottage.

High-pressure steam line.—On account of the shortage of labor we have found it impossible to make the necessary changes in the heating system to install an auxiliary line of pipe which would permit us to use a high-pressure steam line during the summer months while our larger lines are being overhauled. We are making plans to make this installation during the coming year.

New steam lines.—In connection with additional steam lines it is desirable to extend our direct heating to the greenhouses, Burrough's cottage, stable, and cow barns, but it may be necessary to get an additional appropriation for this portion of the work, and we will go into this problem in fuller detail under new legislation.

Ice.—The ice plant, which was enlarged during the previous year and moved into new quarters, gave us ample ice and refrigeration sufficient for all purposes and needs. We are able to furnish ice to all parts of the hospital and for its various needs, also refrigeration for the various cold-storage rooms. We have been furnishing ice to the Army aviation branch located at Bolling Field for the general and officers' mess without interfering with the supply necessary for our use.

Bakery.—The increased demands upon our bakery seem to be growing more rapidly than the improvements and additional machinery furnished. During the year 1918 additional machinery purchased consisted of one flour sifter and conveyer, one flour-storage bin, and a 45-gallon water tank and one 4-pocket scaling machine. This machinery is all run by motor and simplifies and expedites the making of bread, rolls, etc. At the present time this machinery is taxed to the limit to turn out the supplies needed for the hospital, and it will be necessary to supply additional machinery or put on additional shifts of men to get out the bread and rolls. It is very difficult at the present time to get competent bakers, and it seems very desirable to get additional machinery. Before we would be able to purchase this machinery it would be necessary to extend the present bakery building. In making extension of this building we must also consider the enlarging of the storage space. The item of additional machinery and storage space would require a special appropriation and will be considered under this head.

Laundry.—The laundry is another department in which the work has increased very rapidly. The more patients we receive and the

the cooperation of the War Department authorities a trench was continued under the track into the District of Columbia's outlet sewer. This drained the water from the hospital dumping ground and the place was regraded and the whole place improved. Orders have been given forbidding the using of this place for a dumping ground in the future. Greater efforts must be put forth looking toward the improvement of the sanitary condition of the grounds, restricting the dumping of waste material except under supervision.

Burrough's cottage.—The cottage to the north of the old Center Building, formerly occupied by a patient of this institution—this cottage having been built by her mother for the use of this patient while in the institution and to revert at the patient's death to the hospital—has become the property of the hospital, the patient having died. This cottage has been fitted up and is being utilized to house couples where both parties are employed in the hospital. During the past year most of the couples living in this cottage are of the class where the man is a member of the Army detailed here and his wife obtained employment during the period of his service at the hospital.

Libraries.—Both the medical and circulating libraries of the hospital are well patronized. The medical library suffered to some extent on account of the failure to receive current foreign periodicals during the period of the war. The card catalogue in the medical library from the Library of Congress and the Surgeon General's library gives us a means of keeping in touch with the publications pertaining to medical subjects in these two libraries. In this way we have access to practically every publication on medicine and its allied subjects, and it gives our staff the benefit of unlimited opportunities for looking up the results of published investigations and researches. The circulation in the patients' library has increased to a great extent during the past year. There are about 2,000 books in circulation. The American Library Association has cooperated with us and their assistance has been of material benefit. Not only have they sent us several hundred books, periodicals, and magazines, but one librarian has been in daily attendance in seeking to enlarge the use of this library, and other attendants have helped here from time to time as their services could be utilized. These representatives visit the various wards, attempt to interest the patients through personal contact, inquire what subjects they are interested in, and if they seem at all inclined to show an interest in any particular books see that they are at once supplied and that other books of similar nature are furnished them. The hospital has been the recipient of quite a large number of books and magazines from other war-working organizations and through popular donations for the benefit of the patients during the past year.

Plumbing.—New closets and lavatories have been installed in Atkins Hall, relief ward 2, Allison–D building 1 and 2, second floor center building, center lodge, old laundry employees' quarters, and tin shop. Wherever these new closets were installed, it was to replace old-style unsanitary plumbing.

Kitchen supplies.—Additional cooking utensils and machinery have been purchased for the kitchen, including a large slicing machine used to slice meat. This machine slices meat uniformly and permits it to be cooked in a more appetizing manner and is economical. New steam kettles were purchased for P building kitchen and aluminum coffee pots of various sizes for the distribution of coffee to the ward dining room. The chef continued his course of lectures for the Nurses' Training School, outlining a course of dietetics.

Industrial department.—The shortage of labor during the past year and the difficulty of getting supplies interfered to some extent with our efforts to increase the work of the industrial department of the institution. The hospital is at the present time, with the cooperation of the Red Cross, entering upon an era of vocational training and recreation for the benefit of its patients. The proposed work consists of a regular classified, systematic course of vocational training in order to assist our patients in occupying themselves. This training is believed to be of great therapeutic value. In occupying the patient we believe that not only will he become useful to himself, have a tendency to improve his condition, but prove of socializing value. While he is occupied, he will have less of a tendency to find fault with himself or others and more satisfied with his conditions and surroundings, and we believe will have a tendency to improve more rapidly and be sooner in a condition where he will reach that state where he may be discharged from the hospital.

Brush Shop.—The brush shop has continued to make most of the brushes used in this institution. All of the work of this shop is done by patients under the supervision of one paid employee.

Mattress shop.—The growth of the institution has materially increased the work of the mattress shop. This department has one paid employee in charge, and with the assistance of several patients makes all the mattresses and pillows needed in this institution, renovates the old hair after it has been used, makes over all mattresses and pillows from time to time, and makes many cloth mats for the general use of the hospital.

Upholstering.—The upholstering department, under the supervision of one paid employee, looks after the upholstering of all furniture of the institution, the making and hanging of all curtains, re-

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Upholstering.—The upholstering department, under the supervision of one paid employee, looks after the upholstering of all furniture of the institution, the making and hanging of all curtains, re-

pairing and regulating of clocks, the cleaning of the chapel and amusement hall, the preparation of the amusement hall for shows, and the cleaning of all rugs and matting.

Shoes.—The shoe manufacture and repair department is under the charge of the same employee, who looks after the brush shop, has one other paid employee and quite a number of patients. During the past year only 78 pairs of shoes were made. All the repairing of shoes and slippers, harness, and other leather goods was made in this department. We hope to increase the output of this department during the coming year. This work is somewhat technical, and it is necessary to take time in training the patients to manufacture shoes and slippers. Raw material has been so difficult to get that no great effort has been made to extend the making of shoes during the past year.

Brooms.—The broom-making department continued to manufacture brooms and whisk brooms during the past year. All the brooms and whisk booms used in the hospital were made there. The total number was 2,610 brooms and 72 whisk brooms.

Straw hats.—The manufacturer of straw hats, located in the basement of Howard Hall, turned in 317 hats during this year. These hats were made out of the straw that comes around tea chests and are what is know as the common or field straw hats and are sufficient to cover the needs of this class of hats during the year. The material costs the hospital nothing, and the labor being altogether that of patients there was practically no cost to the hospital for these hats.

Stockings.—The stocking-knitting machines have been in little use during the past year, but these machines are being turned over to the criminal department for use, and we believe there will be an increased output during the next year.

Preserves and chili sauce.—We have received a large quantity of fruit and garden products from our farm, orchards, and gardens during the past year, some of which we were able to can and put up in chili sauce and catsup for winter use.

Tailor shop and sewing room.—The tailor's shop and sewing room practically manufacture all the bed linen and house supplies used in this institution. Most of the women's wearing apparel and practically all of the men's wearing apparel is made here. It has been difficult at times to get the number of patients we could use in this department, but we hope that we will be able to get an increased number in a short time and be able to turn out material as it is needed.

Fire department.—The chief of the fire department has made regular inspections during the year, testing out all fire hydrants to see that they were in good repair, trying out all fire extinguishers and recharging same. He has held fire drills at least once each month,

tested out all fire hose under pressure, and investigated fire escapes, fireproof stairways, basements, tunnels, and attics. During the year all worn-out material has been replaced or will be replaced in a short time.

Hospital personnel.—During the past year the hospital was confronted with many difficulties, some of which still exist. These difficulties, due primarily to the war in which this country was engaged, were far reaching, and although the reconstruction period is now at hand we have not been able to overcome them. By far the greatest of all difficulties was that of labor. We were confronted with loss of help—first, by the great need of the War Department of men in the Army. Many of our employees left voluntarily to join the Army; others were drafted as needed. During the closing days of the war the number of vacancies in the ward and kitchen service was so great that it was necessary for us to ask the assistance of the service branches of the Government. We first tried to get this assistance from the development detachment of the Army—those classes of men that were deficient in some manner so that they could not be considered the proper timber to be sent into the fighting area. Visits were made to several camps and approximately 75 men selected, who were sent to this hospital for work. This attempt to get assistance from the development detachment proved to be a failure. Out of those that were examined only a few were selected, and out of the few that the hospital selected the vast majority proved that they could not do the required work, and we were compelled to ask the War Department to transfer them back to camp. After our failure in getting assistance from the development detachment of the Army, we requested the General Staff of the Army to detail a medical detachment, composed of commissioned officers, noncommissioned officers, and privates, for such use in this institution as could be given for the benefit of the service men. Assistance was furnished us in this manner, and at the present time we have a detachment from the Medical Corps of the Army, composed of physicians, hospital corps men, and others. and several physicians and members of the Navy hospital corps. These men have helped us materially when we were very badly in need of help. We have lately been getting additional civilian help, many of our old employees returning, and now that Congress has by appropriation and legislation enabled us to offer better inducements we hope it will not be long now before we are able to fill all vacancies with an adequate class of help and permit the service men, so kindly loaned us, to be transferred to other stations.

Supplies.—The difficulties encountered in reference to the help mentioned, on account of the war in general and the policies of the authorities conducting the food and fuel services of the country, affected us not only in the manner of handling the help, but also in

everything pertaining to the help, the supplies used, and the manner in which they were used. The question of food arose and caused us many anxious moments as to how we would meet the situation, be able to furnish adequate supplies to our patients, and conform to the rules and regulations of the Food Administration. The situation seemed to be serious. Under the conditions as set forth, we decided that there was only one course for us to pursue—namely, to cooperate with the Food Administration in their method of shaping the country's policy. Representatives were received here from the various sections of the country who represented the Food Administration, particularly that branch of it pertaining to the feeding of institutions. Forms of dietaries were compiled, showing changes and classes of food and the strength that these diets contained. The calories were figured and the food furnished to each patient was made sufficient as to prevent any hardship in this line. The quantities furnished were reduced materially over what was furnished formerly, but in no cases were these quantities reduced to such an extent as to interfere with his health or his proper nourishing. In an attempt to raise large crops, the hospital used several of the lawns, the baseball fields, and other portions of the ground. Intensified gardening was entered upon and everything done to interest our employees and patients to place before them the fact that the country needed conservation and their assistance in getting larger food crops and using less of the items of food that could be used for other purposes.

Since the end of the war we have been gradually increasing the dietary and improving the meals furnished. Under new appropriation we will be able to employ dietitians for such service, who will have charge of the inspection and serving of food. We will be able to pay higher salaries for employees engaged in the preparation of the food.

Fuel.—Among other difficulties that the hospital had to contend with during the period of the war was to secure the proper amount and class of fuel. The coal of the country was under the supervision of the Fuel Administration. The hospital had no say in the question as to the class of coal to be furnished, when it would be furnished, how it was to be delivered, or to the cost of furnishing same and the methods of payment. We were permitted to present our problem to the Fuel Administration, who allotted certain quantities of coal to the hospital. We were informed that the demand for fuel exceeded the supply, that the Fuel Administrator would keep us supplied, but that we would be obliged to accept what he furnished us. The Fuel Administrator placed a price upon all fuel, making certain charges for deliveries in box cars on account of excessive cost of loading, additional charges for deliveries some distance from the mouth of the mines on account of the cost of hauling, additional charges on

account of reconsignment and reloading of coal consigned to one source and furnished to another, charges for freight sometimes irrespective of distance, and the consumer was compelled to pay without question these various charges, in addition to the charge for the coal as mined, notwithstanding the fact that much of the coal was so inferior that it hardly paid us to unload it. The effect of receiving coal in the manner stated and of the class that was delivered was that we were compelled to use a great deal larger quantity than we would otherwise. This coal was so highly inflammable and contained such an excessive amount of sulphur and phosphorus that it was repeatedly on fire. Much of the coal was lost on account of being burnt, and this resulted in additional labor to make disposition of the coal that was burnt to ashes and other residue. This coal clinkered very easily, apparently was full of iron, sulphur, and other foreign products, and did a great deal of damage to the grates. The loss of our regular employees compelled us to employ inexperienced firemen, some of them former patients and enlisted men detailed for service here, who had had no training as firemen. Naturally under these conditions it was impossible to keep regular records of the amount of coal consumed, and we had a great deal of trouble keeping the boilers under fire at all times. Fortunately, we had a very mild winter and were able to keep a sufficient number of boilers under fire to furnish adequate heat suitable to our needs.

Boiler repairs.—Many additional repair parts for our boilers and stokers have been purchased, and we are overhauling all of them this summer and replacing parts that have been worn out.

Other supplies.—We found difficulty in securing other classes of supplies needed in the hospital for the same reasons which have been enumerated—namely, that preference must be given for supplies needed in the service branches of the Government and a certain amount to be sent abroad for our Allies. Many classes of material could not be obtained at all and we were compelled to accept substitutes. Mills changed their output, as, for example, those formerly making cloth for costumes devoted their whole time to manufacturing cloth in making garments for soldiers. Carpet and rug factories manufactured only blankets, to be disposed of to the Army and Navy and for foreign use. All material where wool was needed we found difficulty in securing, and then only where a limited percentage of wool was used. Medical and surgical supplies were difficult to obtain. In some instances we were told that all of certain classes of supplies manufactured were used for the Army and Navy; in other cases, that the supplies were formerly made by our enemy aliens and substitutes had not as yet been secured in sufficient quantities to fill our needs. Thus we were confronted by obstacles on all sides and only by the most persistent efforts were we able to keep the place func-

tioning and to obtain facilities necessary to continue the operation of the hospital.

Influenza.—In addition to the other obstacles mentioned we suffered severely from the epidemic of "influenza." While there was a large number of those who were ill—there were 669 patients and 171 employees, 840 cases in all—yet the fatalities, excepting among the older patients, were very few. As soon as a patient or employee was found to be suffering with this disease he was transferred to the isolation building, two buildings having been set aside to receive the sick suffering from influenza. The number of employees who were affected was so great that at one perod we were hard pressed in order to secure a sufficient number of ward employees to look after our patients.

Roofs.—Lack of proper help has prevented us from repairing and remodeling the roofs and gutters of the main buildings to any extent. We could not do more than keep them in sufficient state of repair to prevent leaks. There are many of the roofs that will require complete overhauling, several gutters that will have to be replaced, and some of the spouts must be replaced and extended. The roofs of the old boiler and power house and engine room are in such condition that we must at once make arrangements to replace them. The superintendent of construction has been requested to enter into arrangements for getting material and labor to do this work. The roof on the new boiler house will require some immediate repairs, and this work will be done in connection with the new roofs on the other part of the power plant.

Welfare workers.—Representatives of the various welfare workers of the country are on duty at this hospital. The Young Men's Christian Association has had permanent representatives here from time to time, having an office in the Male Nurses Home, and have been continuously on duty trying to assist the service men of this institution. The Red Cross has had several representatives and numerous visitors who have offered their service in helping to look after the welfare and entertainment of our patients and employees. The Knights of Columbus and the Jewish Welfare Association have also had representatives on the place, who have assisted in looking after the welfare and entertainment of our patients and employees. Numerous volunteer workers have been continuously at the hospital, giving their services and helping to entertain and look after the welfare of our patients. We have at all times extended our assistance and a welcome to these various workers.

Gifts and entertainments.—The hospital has been the recipient, among other things, of many gifts from various organizations and individuals throughout the country. These gifts include player piano, victrolas, and other automatic musical contrivances; cigars,

cigarettes, and tobacco in all forms; fruits, candies, newspapers, books, periodicals, and magazines, and many small presents of a miscellaneous nature. The patients have been given entertainments in the shape of operas, musical comedies, vaudeville and moving-picture shows, boxing and wrestling matches, baseball, and excursions, including various trips to the city in automobiles.

Opinion of the Attorney General of the United States in re war-risk patients.—In a communication dated April 14th last, the Attorney General gave it as his opinion that war-risk patients, inasmuch as they had been accepted and served in the Army, that they are entitled to the necessary hospital service under the war-risk insurance act; that as the Secretary of the Treasury is the head of the department of which the Bureau of War Risk Insurance is a part, he is of the opinion that patients were properly admitted to this institution upon the order of the Secretary of the Treasury. He also stated that the hospital service to which these patients were entitled is included in the purposes for which appropriations are made for the use of war-risk insurance, and the cost of same should be paid out of these appropriations. He further stated, in answer to what he calls "Question 3": "The only provision for a judicial inquiry into the mental status of any persons previous to their admission to the hospital (St. Elizabeths Hospital) is in the case of indigent persons residing in the District of Columbia. The war-risk insurance patient does not come within this class, and hence no such judicial inquiry is necessary in his case." This opinion of the Attorney General seems to touch the basis of the contention in reference to so many of the patients admitted to this hospital from the Army and Navy, who, after their discharge from the Army or Navy and those sent here from the Soldiers' Home, claim that the superintendent has no authority to hold them without a judicial inquiry into their mental status.

Isolation building.—The isolation building authorized by Congress to be built at this institution at a cost of $5,000 has not been constructed. The cost of labor and building material has increased to such an extent during the period of war that it would have required several times the amount of the appropriation to construct this building. This appropriation is a continuous one, and we believe that the best interests of the hospital are conserved by postponing the construction of this building until a later period.

Condition of office work.—On account of the shortage of help, the work of the offices of the hospital has been in arrears during the past year, and we are just commencing to catch up on the work. It has been impossible to get clerks, stenographers, and bookkeepers to keep this work up to date. The statement in reference to unit cost was

not rendered from July 1 up to December 31, and at that time a one 6-months' statement was compiled in order to keep our files intact. We later prepared a statement from January 1 to March 31, inclusive, and have tried to continue the statements since that date. We are gathering the necessary statistics from time to time and hope to be able to keep an accurate report of this work. The histories of patients are somewhat in arrears. The file and record clerks have been enabled to get their work up to date, notwithstanding the tremendous amount of work that has been added to this department, due to the fact that extra help has been given them. The records have increased so rapidly that some arrangement will have to be made to get additional storage space. The room devoted to storage and filing of records is now very crowded. Wall space has been added in the telephone room and this is crowded. Additional wall space may be taken from the telephone room, but this will be only a makeshift and last but a few months. The problem now confronts us as to where to get more space.

Crowded condition of the offices.—The same condition which will apply to the record room applies to the various other offices. The various medical offices are very crowded. The reception room on the second floor of the Administration Building right over the entrance is being used by the clinical psychiatrist and his assistant. The senior, junior, and female physicians' office is very crowded. The offices of the typewriters, bookkeepers, and Civil Service are too crowded to be able to do good work. It is very desirable that arrangements be made to extend the offices, and the best plan undoubtedly would be if the whole of the Administration Building were used for office purposes. Before this could be done, it would be necessary to make other arrangements to take care of the medical staff. This could be done in either of two ways. First, by providing staff quarters, and, second, by paying commutation instead of quarters and subsistence. This will be an important question during the next few months and will require careful consideration. It may be necessary temporarily to use some of the rooms on the first floor of the Center Building for office purposes.

Committee of specialists.—The conditions in the hospital as the result of shortage of help, difficulty in getting supplies, deficiency in the appropriations, and the greatly increased number of patients admitted to the institution interfered materially in the functioning of the work of the hospital. As stated, conditions were such that we were compelled to seek assistance from the Army and Navy branches of the Government. This assistance was only temporary until other arrangements could be made. Repeated advertisements were placed in the papers, but no replies were received from the male help and very few from female helpers. A general résumé of con-

ditions was placed before the Board of Visitors and Admiral Braisted, who succeeded to the presidency, appointed a committee of specialists, consisting of one from the National Association of Mental Hygiene, one from the Army, one from the Navy, and one from this hospital, to confer with the superintendent for the purpose of making such suggestions as they consider would be best for reorganizing the hospital and improving the conditions in same. As the result of the report of this committee a supplemental appropriation was requested of Congress for the purpose of raising the salaries of the medical and scientific staff and ward service employees, making certain additions to the staff of various classes of medical and scientific officers, providing for new positions, such as vocational director, director of recreation, dietitians, technicians, etc. Additional supplemental estimates were submitted to Congress for various other items, including authority to adjust the pay roll. These items will be given consideration in order.

Adjusting pay roll.—The first item of a supplemental appropriation for increasing salaries and providing officers for additional positions, and other employees as stated, met with a ready response by Congress, who increased our appropriation from $675,000 to $1,000,000 and authorized the Secretary of the Interior to adjust the compensation of officers and employees at this hospital.

Acting under the legislation included in this appropriation bill, a statement has been prepared and submitted to the Secretary of the Interior, containing a list of all positions in the hospital June 30, together with the pay received at that time, and a column showing the increased pay that it is proposed to pay these same employees, a list of the new positions that it was proposed to create and the salaries each was to pay, the changes in some positions, with the recommendation that the Secretary of the Interior give his approval so that these changes may be put into effect.

X-ray and dental outfits.—Another recommendation made by this committee of specialists was that the Secretary of War be authorized and directed to transfer to this hospital the X-ray and dental outfits at present loaned to the hospital by the medical branch of the War Department. This recommendation received the approval of Congress, and we have written a letter to the Secretary of the Interior asking that he request the Secretary of War to take the necessary steps to transfer to the hospital the apparatus and outfit mentioned.

Motor vehicles.—Another recommendation of this committee of specialists was that the Secretary of War be authorized and directed to transfer without charge to St. Elizabeths Hospital one motor ambulance, eight motor trucks, and not to exceed 11 passenger-carrying motor vehicles for use in the general hospital business.

It was also requested that an appropriation of $20,000 be made to build a garage in which to house these motor vehicles.

Congress authorized the transfer of the motor vehicles asked for, but refused to give us the appropriation for the garage. A letter has been written to the Secretary of the Interior, requesting him to ask the Secretary of War to transfer these motor vehicles as authorized by Congress. The hospital will be compelled to provide some place in which these motor vehicles can be taken care of, and at present it would seem that the best way would be by utilizing part of the carriage shed attached to the stable. This could be fixed up at a slight expense, and we believe would serve temporarily for this purpose.

Among other items recommended by the committee of specialists, which were included in the supplemental estimates submitted to Congress and which failed to receive their approval, were the following, which should be included in the estimates for the fiscal year ending June 30, 1921:

Bulletin.—Authority be requested to publish the results of the scientific investigations of this hospital in a bulletin for the public's information.

Scientific department.—Special appropriations be made for the scientific department at this hospital, separate and apart from the appropriation for the support and maintenance of patients, in a sufficient sum to pay the salaries of employees of this department and for the supplies needed for scientific investigation.

Hydrotherapeutic apparatus.—An item of $20,000 for hydrotherapeutic apparatus and continuous baths in order to install in each service of the hospital this class of apparatus. This hospital is divided up into various services under separate senior physicians, and the most modern curative treatment of the mentally ill patients would require that apparatus of this sort be installed in order to give them the benefit of its use. At the present time we have some of these apparatus in our buildings, and we know of no other single item that has done more to add to the comfort of the patients and relieve them when restless and disturbed than the proper use of the hydrotherapeutic apparatus.

Physiotherapy.—An item of $1,000 is requested for providing physiotherapy in connection with the treatment of certain diseases of our patients. This hospital has no apparatus of this kind, but requires it in order to give the proper care and treatment to patients.

High-pressure water and steam lines.—An item of $20,000 is requested for extending the high-pressure water and steam lines, especially to the semipermanent buildings, in order to continue the high-pressure water lines around these buildings. The hospital has a high-pressure water line installed, through which lines we are enabled to send four or five streams of water to the roofs of any building with-

out the assistance of the fire engine. Since the installation of this high-pressure system the semipermanent buildings have been erected, these buildings consisting of seven-ward buildings, dining room, and kitchen, and having a capacity of 500 patients. While these buildings are constructed with wire laths covered and coated with stucco and plaster boards on the interior, which makes them slow burning, nevertheless we think that the utmost protection should be given to the patients that will be taken care of in these buildings and that this high-pressure water line should be extended for this purpose. A part of this item is for the purpose of extending our steam lines. Some of the buildings of the hospital group are not connected with our main power plant and require the maintenance of separate boiler and furnaces. With the appropriation requested, we believe we can extend steam lines to buildings known as Burroughs cottage, greenhouse, stable, and cow barn.

Laundry machinery.—An item of $8,500 should be requested to provide additional machinery for the laundry by purchasing one flatwork ironer with direct-connected motor drive, one drying tumbler with galvanized woven-wire cylinder, and one shirt-body press with tandem attachment. The increase of work in our laundry has grown to such an extent that it is almost impossible to get out laundry in the time needed and keep this work up to our standard without getting additional machinery. We are at present turning out approximately 4,000,000 pieces of laundry a year, and the work is continually increasing so that we will have to provide the machinery or put on extra shifts of employees. The extra shift of employees would mean a continuous appropriation, while the single appropriation for machinery would take its place and prove an economical adjustment.

Porches.—An item of $100,000 should be requested for building porches and making changes in the old section of the hospital. The old or original section of the hospital was built in a sort of continuous chain of buildings—that is, each time an addition was desired a new wing was added or the original wing extended. These buildings or wings are constructed with dormitories or rooms on the outside and include a window for ventilation. Along the center of this building or wing is a corridor which is used as a day room by the patients. This corridor, especially when the doors are closed, is a cold, dark, and dreary place, in which these patients must spend much of their time. It is desired to make such changes in these buildings as would permit the erection of iron or concrete porches to be used as day rooms or dormitories to give the patients the benefit of some light and fresh air. We believe this to be for the best interests of the patients, adding to their health and comfort and their chances of recovery.

Garage.—An item should be requested, amounting to $20,000, for one concrete garage in which to keep the motor vehicles that the last Congress authorized to be transferred from the War Department.

Bakery extension.—An item of $35,000 should be requested for extending the bakery, putting in concrete floors and additional machinery, and constructing an additional story on the present bakeshop to be used for storing flour. It is our plan to have a chute connected with this store shop in which flour will be sent down through a sieve to the dough mixer on the floor below. This will save handling and simplify the making of the dough. The growth of our institution requires baking of larger quantities of bread and pastry. To provide bread needed, the apparatus already in place is continually in use. We have difficulty in getting sufficient number of bakers, and we think it advisable to provide labor-saving devices such as molders and cutters to assist in this department. The storage capacity of the present bakeshop is hardly sufficient for one month's supply of flour. We are now using more flour than formerly, and in case of emergency we should at all times have a sufficient supply on hand to take care of our immediate need until additional supplies can be received. The estimate of additional capacity has been included in this item, and we believe the best interests of the institution will be conserved by making the extension of the bakery as requested.

Scientific meetings.—We should request that an allotment be made out of the support appropriation, not exceeding $2,500, for paying the expenses of members of the staff while attending scientific meetings. It is desired to have the members of our staff attend these meetings and keep in touch with the most progressive and modern features of the medical science in order to give our patients the benefits of the latest and most approved curative methods of treatment. For this reason in order to make an incentive for our staff to attend these meetings this appropriation is requested.

Sun Dial.—Among the other items for which new legislation should be secured is authority to publish the Sun Dial, a publication used as a medium through which the office of the hospital and the patients and employees are brought together. This Sun Dial has been published at the hospital during the past two years at irregular intervals and contains articles by members of the staff and by patients of general interest to the patients and employees.

We believe this publication serves a useful purpose and that its use will be even more extended under modern conditions connected with recreational and vocational training.

Admissions to the hospital.—Legislation should be requested changing the method of admission into this institution and permitting voluntary admission of the mentally ill who may need the

treatment that may be provided. This legislation would permit the commitment to the hospital of patients by the judge presiding in the district court, based upon the recommendation of a commission composed of medical men, and would not necessitate the adjudication of the patient's mental status unless demanded by the patient or family. The portion of the bill devoted to voluntary admission would permit anyone who has mental trouble to come into this hospital and ask for treatment in the same manner that any sick person could go to a dispensary of a municipal hospital when he is in need of treatment.

Deputy disbursing officer.—Authority should be requested to appoint a deputy disbursing officer to act in the absence of the regular disbursing officer of the hospital. The work of the financial office is increasing to a great extent; the amount of the appropriations are getting larger each year; the money to the credit of patients is multiplying each month; many of our patients are beneficiaries of the Bureau of War Risk Insurance and receive monthly compensation checks; these various funds are subject to payments and withdrawals daily. It is necessary at all times to have a competent person on hand who is authorized to make payments on account of vouchers presented or to pay patients who are leaving the hospital either by discharge, transfer to another institution, or for what not.

Support appropriation.—It is difficult to say as to the exact amount of money that will be needed in this hospital for the fiscal year ending June 30, 1921, on account of support of the patients. Included in the support of patients in this hospital is primarily the maintenance and treatment of patients located at this hospital. These are broad terms. Under these terms should be provided not only food and medical treatment, but also clothes, bed wear, table ware, furniture, floor coverings, surgical and scientific supplies—but, in addition to all the foregoing, the pay roll and maintenance of all the employees. We must also supply food and medical supplies for the sick, pay roll for the farm and garden employees, provide for the laundry, the upkeep of the greenhouse, and the cost of recreation and vocation. The cost of the foregoing must be included in figuring the per capita cost of the patients at this hospital. In previous years we have taken the average population during the preceding year, used the number on hand at the beginning of the fiscal year as a basis, and estimating admissions, guessed at some figure to be used as a basis of our estimates for appropriations.

The prices of supplies varied so during the past few years that this has been a mere guess. Fuel has increased over 100 per cent. The pay roll is continually changing. The entrance salary of female employees has varied approximately 300 per cent.

The number of patients in the hospital June 30, 1919, was 3,586; increase, 211; admitted during the year, 1,802; died, 501; discharged improved, unimproved, and by transfer, 1,090; total remaining of the admissions, 211; this agreeing with the increase noted in the foregoing. The daily average number of patients in the hospital during the fiscal year ending June 30, 1918, was 3,330; the daily average of patients in the hospital for the year ending June 30, 1919, 3,638—an increase in daily average of 308. The number of admissions, 1,802, was mostly during the first eight months of the year. The Army has sent no patients to this hospital since February on account of the crowded conditions and the shortage of help, and the Soldiers' Home has sent none during the past year based upon our request; otherwise, the number of admissions would probably have increased to a tremendous extent. The largest number of admissions to this hospital in one year previous to this was 1,054. This year, as noted, there were 1,802. It is impossible to say what the number of admissions will be during the fiscal year ending June 30, 1921, or what the population will be that will have to be taken care of.

During the fiscal year ending June 30, 1920, Congress has made an appropriation of $1,000,000 for support, clothing, and treatment of the Federal patients. With this $1,000,000 the hospital will be expected to support, furnish clothing and treatment to patients, and furnish all other supplies as needed in this institution; and it is further provided that the Secretary of the Interior is authorized to adjust the compensation of officers and employees at the hospital. We will hardly need less during the following fiscal year than will be needed during the present fiscal year. We therefore believe that the best interests will be conserved by transmitting an estimate for $1,000,000, the amount that is appropriated this year, to be utilized the following year. We recommend this amount, based upon the following reasons: We do not believe we will have a less number of patients as an average; we do not believe that the cost of supplies will be less; and we are pretty sure that the cost of labor will be equal to what it is at present, if not higher.

Repairs and improvements.—We recommend that the appropriation requested for repairs and improvements be increased from $60,000, as appropriated for the fiscal year ending June 30, 1920, to $100,000. During the past two years it has been impossible, on account of lack of labor, to make all the repairs that were necessary to the buildings of the hospital. Many of the roofs will have to be replaced, the plumbing and steam fitting and new floors put in many rooms and dormitories. The cost of labor has increased materially. During the fiscal year ending June 30, 1919, we had an appropriation amounting to $55,000 and a deficiency appropriation of $30,000 additional. The value of the buildings at this hospital is approximately

$5,000,000. A fair cost of repairs and improvements is at the rate of 2 per cent. At the rate of 2 per cent on $5,000,000 it would require $100,000 to keep the various buildings at this hospital in repair. Considering the accumulated repairs during the past two years and the high cost of labor and material, we believe that $100,000 will be needed.

Roadways, walks, and gradings.—We recommend that an appropriation of $5,000 be requested for roadways, walks, and grading. This is the same amount as has been authorized for the past few years. At least this much will be needed to go over our roads, which are at present in very bad condition.

The following list of improvements are suggested, some of which may be made without special legislation, and others while not estimated for this year should be included in subsequent estimates.

Gate houses.—The hospital should be provided with new gate houses, one to be located at the south or second gate on the east side of Nichols Avenue and one to be located at the entrance to the Richardson group and semipermanent buildings. These gate houses are badly needed in order to keep the hospital gates properly protected and permit the patients the freedom of the grounds and provide proper protection from the weather to those waiting for cars.

Public comfort stations.—In connection with these buildings we should also have at various places around the reservation public comfort stations. These should be used by visitors, employees, and patients.

Propagation building.—The hospital needs a propagation building. Nothing adds more to a sick ward than plenty of fresh flowers and plants. These plants and flowers are raised in the hospital's greenhouses. Some of the greenhouses that we have here have been in existence many years and need thorough overhauling. We have had no addition to the number of houses for many years. During this time the hospital has practically doubled in population and in the number of buildings in use. It is therefore very desirable to get this additional building for raising plants and flowers, and we think that at some time in the near future an estimate should be requested therefor.

Matron's quarters.—As soon as the shop building is completed and the electricians have moved out of the old Center Lodge and the tinner out of the old laundry building, this group should be renovated and reconstructed and made into matron's quarters. In one end of this building should be moved the mattress shop and the other end adjacent to the laundry used by the matron for receiving the linen through the laundry and giving out new linen and bed wear to the various wards.

Retreat building.—Retreat building should be remodeled by tearing out the front and building up porches, these porches to be inclosed and used as day rooms by the patients on these wards. This would make these porches much lighter and give the patients plenty of fresh air and more room to move around.

Staff quarters.—The Administration Building at present is very crowded. There is insufficient office room for our purposes. The record room, as noted, requires more space. The offices of the various members of the medical staff need more room to do efficient work. Other members of the staff have no offices in which to do their work properly. It is desirable to use the whole Administration Building for office purposes. Before this can be done separate buildings must be constructed in which to house the staff. It is very desirable that an appropriation be estimated for authorizing the building of quarters for various members of the staff and the turning over of the Administration Building altogether for business purposes.

Epileptic colony.—It may be desirable at some time in making our estimates to include an item authorizing the building of a separate colony for the epileptics.

Change method of appropriating for District of Columbia patients.—The present methods of making appropriations include certain items in the sundry civil bill for patients and the balance in the District of Columbia appropriation bill. Before the hospital has a right to use the amount in the District appropriation bill we must render a bill at the end of each month showing the amount of money that has been earned on account of the board and treatment of District patients, transmit this bill to the District for audit, and after it has been checked up and transmitted through the Treasury the money is then transferred to the hospital for use. During the last months of the fiscal year this handicapped the hospital to a great extent in the paying of its obligations. The hospital must use the appropriations for each year before the end of the fiscal year. The hospital can not secure the money to pay the bills for supplies used during the year nor figure the exact amount of money it will receive from the District until after the termination of the fiscal year, and a bill is rendered showing the number of days in which the District patients have received food and treatment. On the one hand, we have an act of Congress saying that all money must be spent before the end of the fiscal year, and on the other that we can not secure the money to spend until after the termination of the fiscal year. This has embarrassed us very materially during the past few years. In order to relieve us somewhat, it has been the practice of the Commissioners of the District of Columbia to advance us from time to time previous to the end of the fiscal year such accounts as may have accrued to our benefit, due us on account of

board and treatment prior to the rendering of the monthly bill. During the past fiscal year some of the accounting officers of the Treasury decided that this proceeding was irregular and must be discontinued. It is very desirable that Congress relieve us of this situation. This might be done by incorporating in the sundry civil bill the full amount needed by the hospital for all the Federal patients, including the patients of the District of Columbia, for board and treatment of their patients, the amounts we receive from them to be deposited to the credit of miscellaneous receipts of the general fund of the Treasury.

Automatic telephones.—The 20 stations of the automatic telephones installed have given satisfaction, and we think it is very desirable to add additional number of stations each year until these automatic phones have replaced the city phones throughout the wards of the hospital.

Recreational building.—The recreational building that has been promised to the hospital by the War Department can not be built on account of the lack of funds, and in a letter from the Secretary of War he explains and adds his regrets on account of his inability to construct this building. We believe it desirable that an estimate be made and transmitted to Congress requesting the building of two terra-cotta buildings, one for recreational purposes and one for the use of occupational work. The building for recreational use should be located between the detached kitchen and Hitchcock Hall at the site of the present store building. In the basement of this building could be located a commissary and canteen.

Canteen and commissary privileges.—In connection with the appropriation for this building legislation should be secured authorizing the establishment of this canteen and commissary privileges on behalf of the hospital employees, the canteen and commissary both to be conducted based upon the cost of supplies in a manner similar to canteens and commissaries of the War Department and Navy Department.

Registered nurses.—Steps should be taken to improve the grade of nurses that we have at this hospital. This should be done in two ways: First, by the employment of graduates of general training schools, and second, by rearranging the hospital training school in order to get in touch with training schools in general hospitals, so that our graduates will receive general recognition as registered nurses and be eligible to registration under the city registers. It may be necessary before this can be done to get legislation authorizing the hospital training school to have the qualifications equal to an incorporated training school before the other training schools will exchange nurses and cooperate upon a basis of providing eligibles.

Railroad track.—During the past year we have had considerable trouble, as stated, with the railroad track, due to washouts, poor roadbeds, too light rails, and too many curves. This track should be entirely overhauled, the compound curve just below the power house relaid, going back into the foot of Howard Hall hill, this doing away with the compound curve and laying the track on a more secure basis. Heavier rails should be purchased and new ties put in place.

Heating system.—A plan should be arranged in reference to changing the heating system of this hospital. It would seem that the vacuum system of using exhaust steam would prove the most economical and effective. The amount of heat that is wasted through exhaust steam that is thrown into the air would be sufficient to almost heat all of our buildings. This would prove a considerable saving in fuel and should be worth considerable as a program to be followed. If a thorough plan was made it could be arranged to do a portion of the work, including one or more sections of buildings each year, and gradually in the course of a few years the whole institution might be changed over from the present heating system to the vacuum heating system, using exhaust steam.

Swill should be boiled.—A boiler should be purchased and arrangements made to boil the swill before being fed to the hogs. We have had a good deal of trouble during the past few years on account of loss of hogs from cholera and other causes, and our veterinarian recommended the boiling of the swill, stating that in his estimation this would have the effect of improving these conditions.

Incinerator.—An incinerator should be purchased and used in connection with the sanitary condition of this place. All trash should be at once carried to the place where the incinerator is located and burnt up. Old material could be carried to the same place, sorted out, and reclaimed, all having value disposed of.

Fire department.—The fire department should be enlarged and additional firemen employed, so that representatives will be on hand during the full 24 hours. Sanitary rooms should be constructed under the power house in which the employees of this department may change their clothes and have the necessary toilet facilities.

MEDICAL DEPARTMENT.

Training school.—The entrance examination was held at the hospital October 5, 1918. Twenty-eight (28) attendants entered the examination, nineteen (19) of whom passed and were admitted to the junior class. Three (3) of these have resigned during the year; three (3) have been discharged, and six (6) failed in their midyear examinations and class work. Two (2) former pupils with good records were reinstated, making the junior class at present consist of nine

(9) members. The senior class in the beginning consisted of thirteen (13) members. One (1) has been discharged, leaving twelve (12) in the class at the present time.

Owing to the epidemic of influenza, it was found impossible to begin work until November 12, 1918. By doubling the length of the class periods for the first two months, the lost time was made up and since January 16, 1919, the work has proceeded according to schedule. Up to the present time, the juniors have received seventeen lectures, spent twenty (20) hours in recitation and twenty (20) hours demonstration in addition to their practical work in the ward, which continues throughout the year. The seniors have received twenty-one (21) lectures, spent twenty (20) hours in recitation, and twenty (20) hours demonstration. A special course in dietetics was given the senior class by Mr. D. J. Sullivan, Chef. Each member of the class received (10) hours instruction. Tuesday and Friday mornings special demonstrations are held in the operating room. These include preparation of instruments, dressings solutions, etc. Four members of the class receive these instructions six weeks at a time.

Seven (7) major operations have been performed, and all the minor surgery cared for. In addition a number of fractures have been reduced and plaster casts applied. Each pupil nurse spends one month in the hydrotherapy department. A special course in massage is being given the senior class at the present time by the chief of the training school. Except for the acute shortage of help, the work has been progressing satisfactorily.

Staff conferences.

	Male.	Female.	Total.
Discharge	734	129	863
Visit	96	67	163
Parole	274	.....	274
Diagnosis	735	14	749
Opinion	164	16	180
Total	2,003	226	2,229
Second presentation	505	39	544
Third presentation	121	11	132
Fourth presentation	29	3	32
Fifth presentation	8	.....	8
Sixth presentation	3	4	7
Seventh presentation	3	.....	3
Fortieth presentation	1	.....	1
Forty-first presentation	1	.....	1
Forty-second presentation	1	.....	1
Forty-third presentation	1	.....	1
Forty-fourth presentation	1	.....	1
Total	674	57	731
First presentation	1,329	169	1,498
	2,003	226	2,229

Clinical report, physical diseases, July 1, 1918, to June 30, 1919.

	Male.				Female.				Total.
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	
General diseases.									
Alcoholism	1								1
Anemia	1								1
Carcinoma:									
Breast					1				1
Pancreas							1		1
Stomach			1						1
Uterus					1				1
Diabetes mellitus	1								1
Erysipelas	2		1		2		1		6
Gonorrhea	4		2						6
Influenza	396	47	146	90	73		96	2	850
Malaria	4	2	1		4	5			16
Morphinism	5		1						6
Parotitis, spec	2	1			1				4
Rheumatism:									
Acute	4		2		2				8
Chronic	2	1	2		4		2		11
Syphilis	5		12		2		3		22
Tuberculosis:									
Bone			1				1		2
Glandular			2				1		3
Miliary	2				1				3
Pulmonary	15		8		4		2		29
Diseases of nervous system: organs of special sense.									
Elephantiasis					2				2
Cerebral hemorrhage	1				9	1	2		13
Cerebral tumor	3		1		1				5
Cerumen, impacted			1						1
Concussion	1								1
Conjunctivitis	2	2			2				6
Epilepsy	3				1		1		5
Herpes zoster	2								2
Hordeolum	1								
Iritis			1					3	4
Meningitis, septic	1						1		2
Migraine					14	3			17
Neuralgia:									
Intercostal					1				1
Trifacial	1	1			3			1	6
Neuritis	7	1							8
Ophthalmia	1								1
Otitis media	1	1			2				4
Status epilepticus			2						2
Torticollis	1				1				2
Diseases of circulatory system.									
Aortic insufficiency			1						1
Arteriosclerosis	12		18						30
Endocarditis	1		4		18	1	8		32
Hemorrhoids	3		3		3				9
Mitral insufficiency			1		2	2			5
Pericarditis	1								1
Varicose veins	1								1
Diseases of respiratory system.									
Abscess, pulmonary		1				1			2
Asthma	3								3
Bronchitis:									
Acute	50	13	19		59	33	24	4	202
Chronic	3	1	2		3				9
Coryza	22	2	1		3	1	4		33
Laryngitis	10		1						11
Pleurisy	2	2	1		1		2		8
Pneumonia:									
Bronchial	27	5			5		2		39
Lobar	55		7		3	1	1		67
Pyothorax	4								4
Rhinitis	8	6	8		19	10	13		64

Clinical report, physical diseases, July 1, 1918, to June 30, 1919—Continued.

	Male.				Female.				Total.
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	
Diseases of the digestive system.									
Abscess, alveolar	1								1
Appendicitis, acute	3				1				4
Atrophy of liver						1			1
Cholangitis					1				1
Cholecystitis	1				1				2
Cholelithiasis	1				3		2		6
Colitis	2								2
Enteritis	41				147	2	16		206
Enterocolitis	7	2	18		5	1	17		50
Gastritis	6	1			10	4	13		34
Gastroenteritis	32	2	7		6	2			49
Hernia			4			1			5
Intestinal obstruction			1				1		2
Pharyngitis	19	5	11		3				30
Stomatitis	4		6		9		4		23
Tonsilitis	10	3	5		20	13	17		68
Nonvenereal diseases of genito-urinary system annexa.									
Albuminuria					4		2		6
Cystitis	1				1	1			3
Dysmenorrhea					13	7	2		22
Endometritis							1		1
Fibromyomata							1		1
Menorrhagia					4	1			5
Nephritis:									
Acute	5	1			1				7
Chronic	2		14		4		4		24
Orchitis	1								1
Phimosis	1								1
Prostatitis	1	1	1						3
Pyelonephritis	1								1
Diseases of skin cellular tissue.									
Abscess	45	3	3		14		3		68
Adenitis	6	1			1		1		9
Carbuncle	2				1				3
Decubitis	3		1		2				6
Dermatitis	10						1		11
Dermatitis, venenata	4								4
Eczema	3		3			1			7
Furunculosis	23	1			2		1		27
Lymphadenitis	1								1
Pediculosis	8		2						10
Pemphigus	2				1				3
Scabies	6								6
Tinea, circinata			1		2				3
Urticaria					4				4
Diseases of bones, organs of locomotion.									
Arthritis	2				1	1			4
Periostitis	1								1
Sinusitis					1	1			2
Synovitis	1	1							2
Torticollis	1				1				2
Affections produced by external causes.									
Burns	5	2	5		5		5		22
Dislocation, mandible	1								1
Fracture:									
Clavicle					1				2
Femur					2				6
Fibula	2								1
Humerus	2			1	1	1			2
Mandible	1								5
Nasal	6								1
Radius	3								3

Clinical report, physical diseases, July 1, 1918, to June 30, 1919—Continued.

	Male.				Female.				Total.
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	
Affections produced by external causes—Continued.									
Fractures—Continued.									
Rib	1								1
Scapula	1								1
Tibia	2								2
Hematoma, ear	1		2						3
Sprain:									
Ankle	11				3				14
Hand	2		2						4
Knee	2				1				3
Phalanx	1		2						3
Snake bite	1								1
Sunstroke	1		1						2
Wounds:									
Abraded	28		5		30	1	7		71
Contused	69	6	11		45	1	14		142
Incised		2	1		27	3	3	1	37
Infected	21	3	3		19	1	1		48
Lacerated	177	19	13	1	12		16		238
Total	1,266	139	222	92	656	101	297	11	2,784
Minor operations.									
Casts applied					1				1
Incision, drainage	41	2	3		3		1		50
Injection, salvarsan	66		13		3		1		83
Lumbar punctures	144		24		8		5		181
Suturing wounds	78	18	54		23	2	1		176
Veni puncture	1,155		191		47		34		1,427
X-ray photographs	6	8	6	5	25	4	6	1	61
Total	1,490	28	291	5	110	6	48	1	1,969
Restraints and seclusions.									
Restraints	15		4						19
Seclusions	37		15		8		4		64
Total	52		19		8		4		83
Deaths.									
Anemia, pernicious	1								1
Aortic insufficiency	2		1		1				4
Arteriosclerosis, cerebral					2		2		4
Carcinoma:									
Cervix							2		2
Face	1								1
Jaw	1								1
Pancreas							2		2
Stomach			1				2		3
Uterus					1				1
Cardiac decompensation					1				1
Cardiovascular disease	4						2		6
Cerebral hemorrhage	10		7		14		2		33
Cerebral syphilis	4		1				1		6
Cholecystitis	2								2
Cirrhosis, liver	1								1
Colitis, ulcerative	1								1
Diabetes	1				1				2
Endocarditis, chronic	18				10		5		33
Enteritis					3		1		4
Enterocolitis	5				1				6
Erysipelas	2		1						3
Gangrene, senile							1		1
Gastroenteritis	1				2				3
Influenza	56		4		7		5		72
Intestinal obstruction							1		1
Mitral insufficiency	7								7
Myocarditis	7		3						10
Myocarditis, acute	43		8		1		1		53
Nephritis, chronic	20		4		1				25

Clinical report, physical diseases, July 1, 1918, to June 30, 1919—Continued.

	Males.				Females.				Total.
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	
Deaths—Continued.									
Organic brain disease			4		4				8
Paresis	66		18		1		4		89
Pellagra					2				2
Pericarditis	1								1
Peritonitis	3		1		1		1		6
Pneumonia:									
Bronchial	20		4		6		1		31
Hypostatic	3								3
Inhalation	1								1
Lobar	17		2		1				20
Progressive muscular atrophy	1								1
Pyelonephritis	1								1
Rupture, cardiac	2				1				3
Senility					3		1		4
Septicemia	3								3
Status epilepticus			2						2
Suicide (by strangulation)	3		1		1				5
Sunstroke			1						1
Tuberculosis:									
Miliary	3						1		4
Pulmonary	30				5				35
Ulcer:									
Colon	1								1
Duodenum	1								1
Total	333		63		70		35		501

The following major operations were performed by the consulting staff:

Major operations.

Appendectomies	3
Cholecystectomies	1
Cholecystotomies	1
Thoracotomies	3
Tracheotomies	1
Total	9

The above operations were performed by the following:

Capt. Stewart, United States Army.
Lieut. Erdman, United States Army.
Dr. Lewis H. Taylor, of Washington.
Dr. G. Tully Vaughn, of Washington.
Dr. Charles S. White, of Washington.

CONSULTATIONS.

The patients upon whom the above-named operations were performed were all seen first in consultation by the consulting surgeons. In addition, the last-named three surgeons saw a number of other patients from time to time, and during the year nearly every member of the consulting staff was called upon from time to time to give advice about difficult conditions.

CONTAGIOUS DISEASES.

The influenza epidemic of October, 1918, bore heavily on the hospital, 691 cases occurring during that month, and scattering cases since that time. Altogether 72 patients and 3 employees died from the disease. Otherwise the hospital was fairly free from contagious diseases during the year.

Work of the hydrotherapeutic departments.

	Male.		Female.		Total.
	White.	*Colored.*	*White.*	*Colored.*	
Average number of patients treated per month	98	1	39	38	176
Average number of treatments per month	1,053	1	1,022	839	2,895
Patients treated	1,176	1	470	453	2,100
Total treatments	12,642	15	12,270	10,072	34,999

FIELD WORK.

Owing to war conditions and the consequent shortage of help, there was no regular field officer on duty during the year.

REPORT OF THE CLINICAL PSYCHIATRIST.

Cases given special psychotherapeutic attention:

Dementia precox types	73
Manic-depressive types	19
Psychoneuroses	8
Paranoid states	4
Associated with epilepsy	3
Compulsion neuroses	2
Anxiety neuroses	2
Total	111

Besides the work on selected cases, several series of six lectures each were given to Army medical officers and a series of ward clinics. Lectures were also given before the New York Neurological Society and the Pennsylvania School for Social Service on aspects of psychotherapy.

REPORT OF OPHTHALMOLOGIST.

Number of visits	52
Patients treated	396
Male white	249
Female white	82
Male colored	10
Female colored	18
Employees	37
Total	396

Examinations and treatments:	
Eye, refractions	231
Other eye conditions	72
Total	303
Nose and throat	42
Ear	51
Total	396

DENTAL REPORT.

Total number of patients treated	1,317
Teeth extracted	1,102
Treatments	649
Fillings	658
Cleaning	207
Repair of artificial dentures	25
New artificial dentures	35

SCIENTIFIC DEPARTMENT.

Summary of laboratory examinations for clinical purposes.—The following table gives a summary of the numbers of examinations of different characters that have been made in the laboratories for inclusion in the clinical records, and for diagnosis and treatment:

Clinico-neurological examinations	85	Spinal fluid, globulin	148
Autopsies	164	Spinal fluid, cell counts	142
Histological examinations	2	Schick tests	199
Urines	1,540	Thorax cultures	261
Blood cytology	140	Milk cultures	7
Sputum	107	Spinal fluid cultures	6
Feces	16	Blood cultures	4
Pus, smears, and cultures	22	Cultures of urine and feces	3
Pleural exudates	11	Dental radiographs	317
Gastric contents	2	Radiographs of chest, gastro-intestinal tract, bones and joints, skull, and sinuses	215
Wassermanns	774		
Spinal fluid, gold tests	153		

During April, May, and June records were kept of the numbers of radiographs of special characters other than the teeth, and the 133 radiographs during these three months comprised 68 of the chest, 52 of bones and joints, 5 of the skull, 4 of sinuses, and 4 of the gastro-intestinal tract.

Photographic department.—Only routine work has been done in the photographic department, there being made photographs of patients for the records and the necessary photographic work for the administrative departments and for the pathological laboratory.

One thousand and eighty-three photographs of patients were made and 55 for general scientific and administrative purposes.

Personnel.—The only changes in the permanent staff of the Scientific Department were the resignation of Dr. J. A. F. Pfeiffer and the appointment of Dr. N. D. C. Lewis as pathologist.

From the beginning of the Great War the hospital began to suffer not only from the increased cost of supplies, but from increased difficulty in securing a sufficient number of employees because of the great advantages offered by industrial life. During this country's participation in the war the sufferings of the hospital became acute. From the very first the employees and officers began to voluntarily enlist, and later on the draft took many others, while industrial competition robbed us of many of our most efficient mechanics. In addition to these losses it became practically impossible to secure new employees, and the general result was that during the period of the war the hospital was running at an average of approximately 300 vacancies on its staff of employees, based upon a total number of positions of a little over 800. Because those who left and were drafted were very frequently experienced employees and because those who could be employed were inexperienced, this shortage represents practically the reduction of 50 per cent working efficiency. At the same time the admission rate of the hospital increased rapidly, approximately 100 per cent, so that the actual work devolving upon this reduced force was doubled. Added to all this came the influenza epidemic, with 840 cases of illness, 171 of whom were employees, and it became almost impossible to find a sufficient number of employees to care for the sick. This in broad outline represents the serious problems which the hospital had to face during the war. There were relatively many less-important ones, such as the extreme difficulty in getting supplies, the necessity for reducing the dietary in conformity with the regulations of the Food Administration, and many other things which made it almost impossible for the hospital to continue to function at all. Despite this fact, however, the hospital was able to cooperate with the military branch of the Government and to render considerable service. Classes of enlisted men and of medical officers were sent here for instruction, and that instruction was given as fully and as comprehensively as possible under the circumstances, while the students in turn did duty on the wards and in the laboratories to help supplement the shortage in employees. In this way we received in return for our efforts a considerable amount of help, although, of course, it was uncertain, men coming and going at irregular intervals and without notice. Many of those, however, who came to the hospital in this way for instruction rendered excellent service.

Following the signing of the armistice the Army sent a military detachment of 300 soldiers to assist in conducting the work of the hospital. These were under the command of a lieutenant colonel,

including medical officers and hospital corps men. The Navy also assigned a number of enlisted men and some medical officers also to assist. This assignment enabled the hospital to man its wards and to carry out the more necessary activities.

In addition to the assistance from the Army and Navy, various other organizations helped in a material way. These were the Red Cross, the Y. M. C. A., the K. of C., the Jewish Welfare Association, War Camp Community Service, the American Library Association, Dames of the Loyal Legion, and the Army and Navy Union of the President's Own Garrison. In addition to these organizations various individuals have come forward to assist.

The close of the year finds the military detachment considerably reduced in numbers and preparing to leave. The number of civilian employees is somewhat increased; new ones are coming in slowly. A plan of reorganization of the institution to put us on our feet again after the most severe stress in its history is under way, with prospects of material assistance from Congress and otherwise.

In closing I wish to extend my personal thanks and express my profound appreciation to the members of the hospital organization who stayed with the institution during these months of stress, and did so in many cases at considerable personal sacrifice. It is to them that we owe largely the fact that the hospital did not collapse completely.

PUBLICATIONS.

White, William A., superintendent:

Critical review of the autonomic functions and the personality, by Edward J. Kempf. The Psychoanalytic Review, Vol. VI, No. 1, January, 1919, pp. 89–98.

Outlines of psychiatry. Nervous and mental disease monograph series No. 1 (seventh edition, 1919), p. 319.

Mental hygiene of childhood. Little, Brown & Co., Boston, 1919, p. 193.

Franz, Shepherd Ivory, scientific director:

Handbook of mental examination methods. Second edition, revised and enlarged. The Macmillan Co., New York, 1919, pp. xii, 193.

Rehabilitation and reeducation—physical, mental, and social. Mental Hygiene, 1919, vol. 3, pp. 33–47.

Kempf, Edward J., clinical psychiatrist:

The psychoanalytic treatment of dementia praecox—report of a case. The Psychoanalytic Review, Vol. VI, No. 1, January, 1919, pp. 15–58.

The autonomic functions and the personality. Nervous and Mental Disease Monograph Series No. 28. The Nervous and Mental Disease Publishing Co., Washington, D. C., 1919, p. 156.

O'Malley, Mary, clinical director:

Certain pluriglandular anomalous functions associated with psychopathic sexual interests. Journal of Nervous and Mental Disease, vol. 49, No. 1, July, 1918, pp. 1–35.

Lind, John E., clinical director:

History of medicine. In Nelson's Perpetual Lose-leaf Encyclopedia, October, 1918, revision pages 65–65E.

Silk, Samuel A., senior assistant physician:

The problem of pulmonary tuberculosis in a psychiatric hospital. American Journal of Insantiy, Vol. LXXV, No. 3, January, 1919.

Evarts, Arrah B., senior assistant physician:

A lace creation revealing an incest phantasy. The Psychoanalytic Review, Vol. V, No. 4, October, 1918, pp. 364–380.

Color symbolism. The Psychoanalytic Review, Vol. VI, No. 2, April, 1919, pp. 124–157.

STAFF CHANGES.

The following resignations took effect during the year: J. A. F. Pfeiffer, senior assistant physician; Elmer B. M. Casey, junior assistant physician; Irwin M. Stillman, medical interne; E. Domingo, medical interne; Adolph Jacobs, resident dentist; Ernest H. Wells, dental interne; Arrah B. Evarts, senior assistant physician; George H. Benton, medical interne.

The following new appointments were made: Irwin M. Stillman, medical interne; Edward E. Lazell, assistant clinical psychiatrist; E. Domingo, medical interne; George H. Benton, medical interne; Nolan D. C. Lewis, pathologist; Ernest H. Wells, dental interne; Samuel Bogdonoff, dental interne; Eleanor B. Saunders, medical interne; Lois D. Hubbard, medical interne; Dr. Gertrude R. Davies, medical interne.

STATISTICAL TABLES.

Admissions and discharges.

	Male.			Female.			Total.
	White.	Colored.	Total.	White.	Colored.	Total.	
Remaining June 30, 1918:							
Army	916	62	978				978
Navy	398	17	415				415
Public Health Service	66	7	73				73
Civil life	728	330	1,058	536	315	851	1,909
Total	2,108	416	2,524	536	318	851	3,375
Admitted during 1918–1919:							
Army	781	74	855				855
Navy	292	7	299				299
Public Health Service	25	1	26				26
Civil life	267	102	369	175	78	253	622
Total	1,365	184	1,549	175	78	253	1,802
Discharged during 1918–19:							
Recovered—							
Army	232	13	245				245
Navy	107	3	110				110
Public Health Service	7	2	9				9
Civil life	27	15	42	34	12	46	88
Total	373	33	406	34	12	46	452
Improved—							
Army	129	3	132				132
Navy	74	2	76				76
Public Health Service	8		8				8
Civil life	36	9	45	29	10	39	84
Total	247	14	261	29	10	39	300

Admissions and discharges—Continued.

	Male.			Female.			Total.
	White.	Colored.	Total.	White.	Colored.	Total.	
Discharged during 1918-19—Con.							
Unimproved—							
Army	51	4	55				55
Navy	19	1	20				20
Public Health Service	4		4				4
Civil life	60	18	78	28	10	38	116
Total	134	23	157	28	10	38	195
Not insane—							
Army	101	4	105				105
Navy	11		11				11
Public Health Service	1		1				1
Civil life	12	3	15	8	3	11	26
Total	125	7	132	8	3	11	143
Died—							
Army	156	9	165				165
Navy	50	1	51				51
Public Health Service	9		9				9
Civil life	118	53	171	70	35	105	276
Total	333	63	396	70	35	105	501
Remaining June 30, 1919:							
Army	1,028	103	1,131				1,131
Navy	428	17	445				445
Public Health Service	62	5	67				67
Civil life	743	335	1,078	542	323	865	1,943
Total	2,261	460	2,721	542	323	865	3,586

Admissions and discharged classified according to sex for the year ended June 30, 1919, and since opening of the hospital.

	Year ending June 30, 1919.			Since opening of the hospital.		
	Male.	Female.	Total.	Male.	Female.	Total.
Admitted	1,549	253	1,802	20,799	5,918	26,717
Discharged:						
Recovered	538	57	595	6,665	1,514	8,179
Improved	261	39	300	2,885	1,028	3,913
Unimproved	157	38	195	1,280	475	1,755
Died	396	105	501	7,248	2,036	9,284
Remaining	2,721	865	3,586			
Total admissions				20,799	5,918	26,717

Percentage of total admissions recovered, improved, etc.

	Male.	Female.	Total.
Recovered	32.06	25.59	31.37
Improved	13.88	17.22	14.65
Unimproved	6.16	8.02	6.56
Died	34.81	34.40	34.75
Remaining	13.09	14.77	12.67
	100.00	100.00	100.00

Monthly changes of population.

	Admitted.			Discharged.			Died.			Total, died and discharged.
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.	
1918.										
July	107	22	192	37	5	42	26	11	37	79
August	164	21	185	49	14	63	21	14	35	98
September	140	24	164	53	16	69	18	6	24	93
October	145	33	178	50	9	59	92	14	106	165
November	205	25	230	65	9	74	43	13	56	130
December	168	13	181	72	9	81	33	4	37	118
1919.										
January	169	19	188	91	12	103	38	12	50	153
February	119	20	139	99	11	110	28	9	37	147
March	116	20	136	132	9	141	34	9	43	184
April	73	19	92	94	9	103	28	5	33	136
May	78	24	102	102	12	114	19	6	25	140
June	65	13	78	112	19	131	16	2	18	139
Total	1,549	253	1,802	954	134	1,090	396	105	501	1,591

Ages of patients who died during the year ended June 30, 1919.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
15 to 20 years	8	.....	8	50 to 60 years	39	19	58
20 to 25 years	25	5	30	60 to 70 years	46	22	68
25 to 30 years	45	4	89	70 to 80 years	55	15	70
30 to 35 years	48	10	58	80 to 90 years	20	9	29
35 to 40 years	35	7	42	Over 90 years	1	.....	1
40 to 45 years	40	6	46				
45 to 50 years	34	8	42	Total	396	105	501

Ages of patients admitted during the year ended June 30, 1919.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
5½ to 15 years	7	5	12	45 to 50 years	41	17	58
15 to 20 years	182	19	201	50 to 60 years	39	35	74
20 to 25 years	472	17	489	60 to 70 years	30	23	53
25 to 30 years	350	23	373	70 to 80 years	38	17	55
30 to 35 years	155	21	176	80 to 90 years	17	7	24
35 to 40 years	95	22	117	Unknown	61	18	79
40 to 45 years	62	29	91				
				Total	1,549	253	1,802

Civil condition of patients admitted during the year ended June 30, 1919.

	Male.	Female.	Total.
Single	1,299	110	1,409
Married	206	87	293
Widowed	25	48	73
Divorced	3	.....	3
Unknown	16	8	24
Total	1,549	253	1,802

Duration of mental disease of patients who died during the year ended June 30, 1919.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total
Under 1 month	26	13	39	4 to 6 years	28	7	35
1 to 2 months	25	12	37	6 to 10 years	35	10	45
2 to 4 months	29	7	36	10 to 15 years	32	8	40
4 to 6 months	22	6	28	15 to 20 years	27	5	32
6 to 7 months	16	4	20	20 to 25 years	12	1	13
9 to 12 months	16	4	20	Over 25 years	24	11	35
1 to 2 years	53	7	60				
2 to 4 years	53	8	61	Total	396	105	501

Ages of patients discharged recovered during the year ended June 30, 1919.

Age.	Male.	Female.	Total.
15 to 20 years	63	12	75
20 to 30 years	252	12	264
30 to 40 years	66	11	77
40 to 50 years	19	8	27
50 to 60 years	5	3	8
60 to 70 years	1		1
Total	406	46	452

Duration of residence in the hospital of those recovered during the year ending June 30, 1919.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
20 to 30 days	18	7	7	2	34
1 to 2 months	45	2	5	5	53
2 to 3 months	51	3	3	2	59
3 to 4 months	56	10	3		69
4 to 6 months	117	3	4	1	125
6 to 9 months	63	1	2	2	66
1 to 2 years	7	2	5	2	16
2 to 4 years	8	3	3	2	16
Over 4 years	7	2	2		11
Total	372	33	34	12	452

Nativity of patients admitted during the year and since opening of the hospital in 1855.

	During year.	Since 1855.
Native born:		
Alabama	19	109
Arkansas	7	59
Arizona	3	3
California	12	72
Colorado	2	24
Connecticut	12	165
Dakotas	7	24
Delaware	3	52
District of Columbia	142	3,412
Florida	7	36
Georgia	41	218
Illinois	51	416
Indiana	31	372
Indian Territory	.....	19
Idaho	.....	4
Iowa	23	123
Kansas	13	92
Kentucky	36	406
Louisiana	12	94
Maine	6	187
Maryland	68	1,898
Massachusetts	38	707
Michigan	29	201
Minnesota	23	72
Mississippi	24	101
Missouri	37	259
Montana	1	4
Nebraska	10	33
Nevada	1	1
New Hampshire	5	109
New Jersey	37	290
New Mexico	1	7
New York	119	1,649
North Carolina	35	290
Ohio	53	900
Oklahoma	7	17
Oregon	3	13
Pennsylvania	90	1,349
Rhode Island	7	90
South Carolina	16	131
Tennessee	13	248
Texas	42	170
Utah	3	7
Vermont	4	94
Virginia	101	2,508
Washington	3	6
West Virginia	12	131
Wisconsin	22	1,560
United States	76	76
	1,307	18,927
Foreign born:		
Alsace	.....	2
Armenia	1	5
Austria	27	177
Bahamas	.....	2
Bavaria	.....	17
Belgium	1	11
Bermuda	.....	2
Bulgaria	.....	1
Bohemia	1	15
Foreign born—Continued.		
Brazil	.....	2
British East Indies	.....	9
British Columbia	.....	2
British possessions	.....	4
British West Indies	1	17
Buenos Aires	.....	3
Canada	11	208
Cape Verde Islands	.....	2
Chile	.....	2
Coast of Africa	.....	5
Costa Rica	.....	3
Cuba	.....	11
Cyprus	.....	1
Denmark	4	67
England	13	476
Equador	.....	1
Finland	4	25
France	4	125
Germany	45	1,860
Greece	9	41
Guatemala	.....	1
Holland	1	24
Hungary	5	49
Iceland	.....	1
Ireland	20	2,512
Italy	33	174
Japan	1	18
Korea	.....	1
Malta	.....	3
Mexico	1	20
New Brunswick	.....	4
Newfoundland	.....	5
New Granada	.....	1
Norway	3	87
Nova Scotia	1	27
Panama	.....	1
Philippine Islands	3	26
Poland	15	56
Portugal	.....	11
Prince Edward Island	.....	3
Prussia	.....	42
Porto Rico	9	15
China	.....	6
Roumania	4	13
Russia	44	210
Hawaiian Islands	2	7
Saxony	.....	7
Servia	3	3
Sicily	.....	3
Spain	.....	12
Sweden	8	145
Switzerland	3	93
Turkey	1	13
Venezuela	.....	1
Wales	.....	24
West Indies	4	15
At sea	.....	1
Unascertained	213	943
Total	495	7,790
Grand total	1,802	26,717

Admissions, discharges, and deaths, with the mean annual mortality and proportion of recoveries, per cent of the discharges, including deaths, for each year since the opening of the hospital.

Year.	Admitted.			Discharged.											Remaining June 30 in each year.			Daily average.			Percentage of recoveries on discharges.			Percentage of deaths on average numbers.			Percentage of deaths on total number.		
				Recovered.			Improved.			Unimproved.			Died.																
	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	Total.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.
1855	26	37	63	....	3	3	....	....	....	....	....	....	....	....	....	26	34	60	19.35	20.65	40.00	....	100.00	100.00	....	....	....	....	....	....
1855–56	36	11	47	3	2	5	....	....	....	....	....	....	1	1	5	3	8	54	39	93	41.20	37.98	70.18	37.50	33.33	35.71	12.13	7.09	10.10	8.06	6.66	7.48
1856–57	25	27	52	2	4	6	3	1	4	7	3	10	8	8	16	59	50	109	54.55	42.80	97.35	10.00	25.00	16.66	14.66	18.69	16.43	10.13	12.12	11.03
1857–58	29	14	43	13	5	18	1	1	2	2	....	2	7	6	13	65	52	117	57.70	50.31	108.01	56.52	44.66	51.42	12.13	11.92	12.03	7.95	9.37	8.55
1858–59	47	18	65	16	5	21	1	4	5	5	3	8	6	4	10	84	54	138	72.93	56.24	129.17	57.13	31.25	47.73	8.22	7.11	7.74	5.36	5.71	5.49
1859–60	68	24	92	26	7	33	4	3	7	3	2	5	13	5	18	106	61	167	100.68	59.00	159.68	56.52	41.17	52.38	12.91	8.47	11.27	8.55	6.41	7.25
1860–61	64	31	95	42	11	53	5	2	7	2	....	2	12	7	19	109	72	181	109.72	64.81	174.57	68.85	55.55	65.43	10.93	10.80	10.88	7.06	7.61	7.82
1861–62	174	12	186	96	8	104	14	1	15	....	....	....	26	10	36	147	65	212	123.75	65.74	189.49	70.59	42.10	67.09	21.01	15.21	19.00	9.18	11.90	9.81
1862–63	330	25	355	197	6	203	17	1	18	3	3	6	57	4	61	203	76	279	168.41	72.31	240.72	71.89	42.85	70.45	33.84	5.53	25.34	11.95	4.44	10.76
1863–64	484	25	509	282	6	288	69	1	70	5	....	5	67	8	75	364	86	350	205.73	77.66	283.39	66.66	40.00	65.75	42.56	10.30	26.40	11.75	7.92	9.51
1864–65	478	36	514	315	9	324	110	12	122	11	....	11	139	8	147	167	93	200	277.42	33.81	361.23	54.78	31.03	53.64	50.10	9.54	40.69	18.73	6.55	17.01
1865–66	194	28	222	104	5	109	20	7	27	10	1	11	41	12	53	186	96	282	190.92	90.70	281.62	59.42	20.00	54.50	21.47	13.23	18.82	11.35	9.91	10.99
1866–67	88	21	109	45	7	52	11	3	14	11	1	12	19	14	33	188	92	280	189.06	89.46	279.12	52.32	28.00	46.85	10.02	15.65	11.82	6.93	11.96	8.44
1867–68	120	33	153	49	15	64	6	2	8	5	1	6	22	5	27	226	102	328	221.17	96.44	317.61	59.75	65.22	60.95	9.95	5.18	9.50	7.14	4.00	6.23
1868–69	133	35	168	59	11	70	9	6	15	8	2	10	24	9	33	259	109	368	244.55	108.03	352.58	59.00	39.28	54.69	9.81	8.33	9.35	6.70	6.57	6.65
1869–70	146	36	182	32	8	40	18	8	24	11	3	14	15	3	18	331	123	454	294.69	108.08	402.77	43.24	36.37	41.67	5.09	2.77	4.36	3.71	2.05	3.27
1870–71	161	34	195	50	12	62	21	7	28	4	3	7	33	11	44	384	124	508	354.34	121.66	476.00	46.30	36.36	43.97	9.31	9.04	9.24	6.70	7.00	6.78
1871–72	142	44	186	43	8	51	16	13	29	8	1	9	37	7	44	422	139	561	407.21	131.57	538.78	41.34	27.59	38.34	9.09	5.32	8.16	7.04	4.17	6.34
1872–73	153	51	204	49	15	64	23	5	28	3	5	8	32	13	45	468	152	626	431.03	144.11	575.14	45.40	39.47	44.13	7.42	9.02	7.82	5.56	6.84	5.88
1873–74	192	38	230	67	12	79	22	8	30	6	3	9	39	11	50	526	156	682	492.44	151.36	643.80	50.00	35.29	47.02	7.92	7.27	7.76	5.91	5.79	5.88
1874–75	179	51	230	66	9	75	28	22	50	8	3	11	51	7	58	552	166	718	536.46	164.17	700.63	42.13	21.95	38.66	9.50	4.26	8.27	7.23	3.38	6.36
1875–76	166	47	213	67	17	84	26	10	36	1	....	1	48	18	66	570	168	744	564.78	165.59	730.37	47.18	37.78	45.45	8.49	10.87	9.04	6.68	8.45	7.09
1876–77	147	51	198	66	17	83	27	13	40	2	....	2	45	7	52	583	182	765	587.41	176.30	763.71	47.80	45.94	46.89	7.66	3.96	6.80	6.22	3.19	5.52
1877–78	138	44	182	49	11	60	32	9	41	3	4	7	37	9	46	600	193	793	596.82	184.37	781.19	40.49	33.33	38.96	6.19	4.88	5.88	5.13	5.98	4.35
1878–79	169	53	222	68	24	92	30	7	37	3	1	4	51	12	63	617	202	819	619.10	196.70	815.80	44.73	54.54	46.93	8.23	6.10	7.72	6.63	4.87	6.20
1879–80	181	44	225	38	14	52	23	10	33	....	....	3	46	13	59	691	206	897	655.34	196.63	851.97	35.51	35.00	35.37	7.01	6.61	6.92	5.76	5.28	5.65
1880–81	161	62	223	62	10	72	27	9	36	....	6	6	63	18	81	700	225	925	685.37	111.38	896.78	40.78	23.25	36.92	9.19	8.51	9.03	7.39	6.71	7.23
1881–82	178	69	247	62	21	83	31	8	39	2	5	7	74	27	101	709	233	942	697.10	232.88	929.98	36.69	34.43	36.08	10.61	11.59	10.86	8.44	9.18	8.61
1882–83	201	64	265	76	19	95	33	16	49	....	6	6	46	17	63	755	239	994	729.89	235.27	965.16	49.05	31.03	44.13	6.30	7.22	6.52	5.05	5.72	5.22
1883–84	286	64	347	68	13	81	35	8	43	3	1	4	51	16	67	884	262	1,146	797.21	243.27	1,040.48	42.03	34.21	40.51	6.39	6.57	6.44	4.90	5.33	4.99
1884–85	229	91	320	65	24	89	37	12	49	1	1	2	84	21	105	926	295	1,221	902.41	270.89	1,173.34	34.76	41.37	36.32	9.31	7.75	8.94	7.55	5.95	7.19
1885–86	234	69	303	55	22	77	58	15	73	2	3	5	79	23	102	966	301	1,267	936.39	283.23	1,219.62	28.35	34.92	29.96	8.54	8.12	8.36	6.81	6.32	6.69
1886–87	206	62	268	57	15	72	49	17	66	2	1	3	73	19	92	991	311	1,302	956.07	297.36	1,253.43	31.49	28.48	30.90	7.63	6.38	7.34	6.22	5.23	5.99
1887–88	247	71	318	59	10	69	52	14	66	3	1	4	95	25	120	1,029	332	1,361	1,009.55	315.55	1,325.08	28.23	20.00	26.64	9.41	7.92	9.06	7.67	5.64	7.41
1888–89	213	67	380	50	20	70	27	27	54	5	2	6	86	28	114	1,075	322	1,397	1,049.99	323.83	1,373.82	29.94	25.97	28.69	8.19	8.65	8.30	6.92	7.02	6.90

Admissions, discharges, and deaths, with the mean annual mortality and proportion of recoveries, per cent of the discharges, including deaths, for each year since the opening of the hospital—Continued.

Year.	Admitted			Discharged.											Remaining June 30 in each year.			Daily average.			Percentage of recoveries on discharges.			Percentage of deaths on average numbers.			Percentage of deaths on total number.		
				Recovered.			Improved.			Unimproved.			Died.																
	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.
1889–90	274	71	345	39	6	45	43	6	49	....	3	3	112	28	144	1,115	350	1,055	1,108.57	326.53	1,435.10	20.10	13.95	18.12	10.13	9.59	9.76	8.30	7.48	8.04
1890–91	271	81	352	36	30	66	38	15	53	1	1	2	98	30	128	1,253	355	1,608	1,160.62	344.44	1,505.06	20.81	34.47	26.51	8.44	8.71	8.51	6.87	6.96	6.89
1891–92	233	70	303	56	12	68	69	13	82	8	3	11	121	32	153	1,232	365	1,590	1,226.64	348.65	1,575.29	22.05	20.00	21.66	9.86	9.18	9.71	8.14	7.53	8.01
1892–93	261	84	345	57	10	67	46	23	69	4	1	5	140	41	181	1,246	374	1,620	1,255.56	357.02	1,582.58	23.08	13.33	20.81	11.41	11.48	11.44	9.38	9.13	9.32
1893–94	273	88	361	49	13	62	49	16	65	6	....	6	138	29	167	1,277	404	1,681	1,248.16	369.91	1,618.07	20.24	22.41	20.66	11.31	7.84	10.32	9.08	6.27	8.42
1894–95	293	78	371	68	30	98	40	32	72	1	....	1	143	36	179	1,318	384	1,702	1,280.91	386.16	1,667.07	26.98	30.61	28.00	11.16	9.32	10.73	9.10	7.46	8.72
1895–96	278	92	370	74	15	89	39	14	53	7	1	8	146	41	187	1,330	405	1,735	1,290.08	379.25	1,669.33	27.81	21.12	26.40	11.31	10.81	11.20	9.14	8.61	9.02
1896–97	288	88	377	67	17	84	50	44	94	5	....	5	130	32	162	1,367	400	1,767	1,326.08	383.82	1,709.90	26.58	18.27	24.34	9.80	8.33	9.47	8.02	6.49	7.67
1897–98	347	90	437	84	12	296	30	19	49	8	1	9	167	30	197	1,425	428	1,853	1,388.25	409.75	1,798.00	29.06	19.35	27.35	12.03	7.32	10.96	9.74	6.12	8.94
1898–99	498	105	603	173	16	189	59	29	88	38	10	48	158	35	193	1,495	443	1,938	1,438.33	433.51	1,871.84	40.42	17.77	36.48	10.98	8.07	10.31	8.21	6.56	7.85
1899–1900	434	117	551	118	33	151	55	13	65	8	5	13	152	32	184	1,599	477	2,076	1,594.00	444.54	1,948.54	35.75	39.75	36.56	10.10	7.19	9.44	7.87	5.71	7.39
1900–1901	519	136	655	202	33	235	52	25	77	11	6	17	193	33	226	1,660	516	2,176	1,582.33	483.33	2,066.66	44.10	34.02	42.34	12.19	6.83	10.93	9.11	5.38	8.27
1901–2	532	154	686	209	39	248	78	20	98	9	11	20	137	40	177	1,759	557	2,316	1,675.85	518.16	2,194.01	48.26	34.51	45.42	8.17	7.70	8.06	6.24	5.97	6.18
1902–3	554	180	734	211	50	261	106	25	131	19	6	25	189	69	258	1,782	587	2,369	1,737.58	553.58	2,291.16	39.73	33.33	38.32	10.88	12.47	11.26	8.17	9.36	8.45
1903–4	584	182	766	194	42	236	95	35	130	21	13	34	189	54	245	1,867	625	2,492	1,782.08	577.00	2,360.08	38.87	29.16	36.70	10.60	8.66	10.29	7.98	6.50	7.75
1904–5	493	174	667	151	53	204	101	42	143	12	9	21	181	55	236	1,912	639	2,551	1,848.50	598.00	2,446.50	33.70	33.12	33.55	9.79	9.19	9.64	7.66	6.88	7.47
1905–6	421	180	601	173	60	233	94	33	127	29	13	42	150	52	202	1,887	661	2,548	1,887.50	654.50	2,542.00	38.34	37.34	38.07	7.94	7.95	7.94	6.42	6.34	6.40
1906–7	437	182	619	136	45	181	82	52	134	28	12	40	165	51	216	1,913	683	2,596	1,888.10	671.83	2,569.93	32.60	27.50	31.17	8.68	7.60	8.40	7.09	6.05	6.82
1907–8	472	171	643	123	39	162	80	30	110	28	5	33	156	45	201	1,998	735	2,732	1,965.70	699.00	2,664.70	31.52	32.77	32.40	7.93	6.43	7.54	6.54	5.27	6.20
1908–9	517	174	691	133	60	193	52	30	82	35	7	42	185	70	255	2,110	742	2,852	2,061.00	740.66	2,801.66	31.11	34.13	31.99	8.97	9.46	9.10	7.35	7.70	7.44
1909–10	496	154	650	115	56	171	54	20	74	55	26	81	189	71	260	2,193	723	2,916	2,138.91	734.00	2,872.91	23.00	26.89	24.09	8.87	9.67	9.05	7.25	7.92	7.42
1910–11	443	180	623	165	50	215	47	13	60	96	26	122	212	68	280	2,116	746	2,867	2,143.33	740.67	2,884.00	31.73	31.85	31.76	9.89	9.19	9.70	8.04	7.52	7.91
1911–12	543	190	733	160	51	211	33	19	52	72	30	102	258	74	332	2,136	762	2,898	2,124.43	747.32	2,871.75	30.60	29.31	30.01	12.14	9.96	11.52	9.79	7.96	9.24
1912–13	549	197	746	125	49	174	37	20	57	70	34	104	252	69	321	2,201	787	2,988	2,165.36	785.30	2,950.66	35.34	36.79	35.82	11.64	8.78	10.87	9.38	7.19	8.80
1913–14	572	180	752	115	48	163	42	18	60	99	44	133	250	72	322	2,267	795	3,062	2,231.40	794.00	3,025.40	36.32	43.00	38.20	11.21	9.07	10.64	9.01	7.44	8.61
1914–15	471	185	656	103	30	133	50	23	73	71	28	99	265	72	337	2,249	827	3,076	2,225.00	807.50	3,032.50	23.11	19.60	20.72	11.91	8.92	11.12	9.68	7.35	9.06
1915–16	617	198	815	128	47	175	52	29	81	74	30	104	271	67	338	2,341	852	3,193	2,293.70	829.80	3,123.50	24.38	27.74	25.07	11.82	8.03	10.82	9.49	7.51	8.73
1916–17	668	230	898	170	50	220	61	31	92	72	28	100	326	109	435	2,330	864	3,246	2,351.34	857.66	3,209.00	27.01	22.93	24.80	13.86	12.70	13.56	10.50	10.07	10.63
1917–18	886	168	1,054	284	52	334	113	18	131	98	25	123	247	86	333	2,524	851	3,375	2,474.70	855.30	3,329.00	31.51	25.42	30.55	9.98	10.06	10.00	7.56	8.40	8.14
1918–19	1,549	253	1,802	538	57	595	261	39	300	157	38	195	396	105	501	2,721	865	3,586	2,775.60	862.40	3,638.00	29.21	43.93	31.49	14.27	12.18	13.94	9.77	9.51	9.68

One hundred and forty-three "not insane," 132 males and 11 females, are included with recovered in 1918–19.

Detailed statement of receipts and expenditures for the fiscal year ending June 30, 1918—Additional.

RECEIPTS.

On hand:		
Support, 1918		$43,968.97
Buildings and grounds, 1918:		
General repairs and improvements		7,294.21
Roadways, grading, and walks		2,612.78
For a new fence		619.51
Miscellaneous receipts:		
Board of District of Columbia patients		37,281.20
Board of Marine Hospital Service patients		4,203.64
Board of other patients, sale of stock, etc		22,059.45
Transfer from buildings and grounds, 1917—ice plant		48.05
		118,087.81

EXPENDITURES.

Provisions and stores:			
Class 1.	Foods	$9,759.87	
2.	Yeast	97.20	
3.	Meats, fresh	6,106.48	
4.	Poultry	301.50	
5.	Meats, salt and smoked	5,003.42	
6.	Fish, fresh	425.70	
7.	Fish, salt	1,716.50	
8.	Vegetables, fresh	540.00	
9.	Vegetables, canned	551.50	
10.	Fruits, fresh	72.50	
11.	Fruits, dried	475.00	
12.	Dairy products	3,038.13	
13.	Groceries, wet	4,075.53	
14.	Groceries, dry	1,855.74	
16.	Laundry supplies	119.90	
17.	Crockery and china	375.09	
18.	Tin and ironware	960.07	
19.	Cutlery and plated ware	1.32	
20.	Household supplies	1,469.95	
21.	Toilet articles	40.13	
22.	Fuel	25,930.02	
			62,906.55
Furniture and bedding:			
Class 23.	Furniture	90.02	
24.	Bedding	1,918.52	
25.	Window furniture	227.55	
27.	Sewing machine supplies	1.10	
			2,237.19
Dry goods and clothing:			
Class 28.	Clothing, new	1,334.68	
29.	Clothing material	1,270.58	
30.	Hats, straw	90.60	
32.	Hosiery	184.95	
33.	Haberdashery	202.23	
34.	Shoes and slippers, men's	1,394.19	
35.	Shoes and slippers, women's	198.00	
			4,675.23

Medical supplies:				
Class 36.	Medical supplies		$649.90	
37.	Surgical supplies		395.42	
38.	Laboratory supplies		106.05	
				$1,151.37
Farm and garden:				
Class 39.	Wagons and harness		182.02	
40.	Farm and garden implements		285.25	
41.	Horticultural supplies		314.89	
42.	Stable maintenance		251.37	
42a	Live stock		324.50	
43.	Farm feed		1,545.18	
44.	Dairy feed		4,100.87	
45.	Poultry feed		98.55	
				7,102.63
Miscellaneous:				
Class 46.	Entertainment of patients		26.00	
47.	Return of escaped patients		10.00	
48.	Messages		273.01	
50.	Miscellaneous		897.85	
				1,206.86
Books and stationery:				
Class 52.	Books		24.50	
55.	Periodicals		1.50	
				26.00
Construction:				
Class 56.	Engineer's supplies		924.52	
57.	Electrical supplies		1,047.54	
58.	Carpenter's supplies		124.63	
59.	Tinner's supplies		685.40	
60.	Painter's supplies		804.42	
				3,586.51
Buildings and grounds:				
Class 61.	Pay roll, roadways, grading and walks		92.31	
62.	Roadways, grading and walks		2,234.01	
63.	Pay roll, repairs, and improvements		2,860.95	
64.	Repairs and improvements		4,747.10	
66.	For a new fence		516.14	
68.	Pay roll, new fence		99.00	
				10,549.51
Salaries and wages:				
Class 70.	Officers		3,355.39	
71.	Administrative		2,405.33	
72.	Ward service		7,192.62	
74.	Kitchen service		1,942.00	
75.	Industrial		407.50	
76.	Laundry service		771.58	
77.	Fire department		75.00	
78.	Engineers		2,470.67	
79.	Carpenters and builders		232.50	
81.	Construction		27.00	
83.	Electricians		325.01	
84.	Farm and garden		1,510.17	
85.	Stables		565.70	
86.	Dairy and cow barns		376.00	
87.	Lawns and grounds		442.33	
				22,098.80

Balance in the United States Treasury:		
Support	$2,522.12	
For a new fence	4.37	
Roadways, grading, and walks	15.21	
Repairs and improvements	5.46	
		$2,547.16
Total		118,087.81

Detailed statement of receipts and expenditures for the fiscal year ending June 30, 1919.

RECEIPTS.

Appropriated for:	
Support, 1919	$426,750.00
District of Columbia patients	450,000.00
Board of Marine Hospital Service patients	15,866.18
Board of other patients	43,028.63
Sale of stock, etc	5,613.83
Buildings and grounds, 1919:	
Disallowance refund repairs	8.48
General repairs and improvements	55,000.00
Deficiency—General repairs and improvements	30,000.00
Railroads, grading, and walks	5,000.00
Railroad-track scale	7,000.00
Buildings and grounds, continuous:	
Shop and storehouse building	13,728.54
Semipermanent buildings	193,247.35
Isolation building	5,000.00
Increased compensation, 1919	58,889.48
	1,309,132.49

EXPENDITURES.

Provisions and stores:		
Class 1. Farinaceous foods	$68,976.92	
2. Yeast	785.56	
3. Meats, fresh	87,381.99	
4. Poultry	7,103.37	
5. Meats, salt and smoked	50,860.87	
6. Fresh fish	7,315.70	
7. Salt fish	8,741.04	
8. Vegetables, fresh	13,644.73	
9. Vegetables, canned	10,490.25	
10. Fruits, fresh	222.95	
11. Fruits, dried	7,719.92	
12. Dairy products	46,062.93	
13. Groceries, wet	5,044.11	
14. Groceries, dry	34,488.81	
15. Condiments	234.48	
16. Laundry supplies	7,669.89	
17. Crockery and china	5,001.54	
18. Tin and iron ware	1,103.46	
19. Cutlery and plated ware	616.47	
20. Household supplies	6,217.43	
21. Wooden ware		

Provisions and stores—Continued.		
Class 22. Toilet articles	$2,234.13	
23. Fuel	27,177.31	
		$399,093.86
Furniture and bedding:		
Class 24. Furniture	3,625.57	
25. Bedding	41,207.52	
26. Window furniture	991.00	
27. Table linen	3,332.11	
28. Upholstery and furniture material		
29. Sewing machine supplies	22.55	
30. Carpets, etc	3,133.39	
		52,312.14
Dry goods and clothing:		
Class 31. Clothing, new	7,638.45	
32. Clothing material	23,185.36	
33. Hats, straw	232.00	
34. Hats, felt	544.00	
35. Hosiery	3,576.25	
36. Haberdashery	476.15	
37. Shoes and slippers, men's	11,297.04	
38. Shoes and slippers, women's	2,055.20	
		49,004.45
Medical supplies:		
Class 39. Medical supplies	5,024.29	
40. Surgical supplies	1,622.64	
41. Laboratory supplies	966.99	
		7,613.92
Farm and garden:		
Class 42. Wagons and harness	1,144.64	
43. Farm and garden implements	218.76	
44. Lawns, roads, and grounds	5.52	
45. Farm supplies	74.70	
46. Horticultural supplies	1,433.74	
47. Stable maintenance	285.30	
48. Live stock	252.50	
49. Farm feed	12,194.67	
50. Dairy feed	41,125.94	
51. Poultry feed	1,184.78	
		57,920.55
Miscellaneous:		
Class 52. Entertainment of patients	1,443.20	
53. Traveling expenses	103.67	
54. Supply transportation	26.80	
55. Return of escaped patients	520.00	
56. Messages	1,909.26	
57. Advertisements	585.09	
58. Miscellaneous	685.14	
59. Transportation of patients	56.88	
		5,330.04
Books and stationery:		
Class 60. Stationery supplies	103.72	
61. Printing	21.01	
62. Books	122.77	
63. Periodicals	113.90	
		361.40

Construction:		
Class 64. Engineers' supplies	$11,225.58	
65. Electrical supplies	3,752.95	
66. Carpenters' supplies	975.41	
67. Tinners' supplies	111.89	
68. Painters' supplies	5,368.62	
		$21,434.45
Buildings and grounds:		
Class 69. Pay roll, roadways, grading, and walks	4,643.82	
70. Roadways, grading, and walks	297.43	
71. Pay roll, general repairs, and improvements	28,145.48	
72. General repairs and improvements	48,303.57	
73. Railroad track scale	71.77	
74. Semipermanent buildings	189,841.70	
93. Pay roll, semipermanent buildings	556.81	
94. Shop and storehouse building	43.18	
		271,903.76
Salaries and wages:		
Class 75. Officers	36,288.33	
76. Administrative	29,874.70	
77. Ward service	87,265.36	
78. Domestic service	3,741.39	
79. Kitchen service	24,779.46	
80. Industrial	5,304.33	
81. Laundry service	10,621.09	
82. Fire department	880.00	
83. Engineers	33,692.45	
84. Carpenters and builders	3,620.17	
85. Tinners	1,975.09	
86. Construction	3,364.25	
87. Painters	4,768.75	
88. Electricians	4,376.03	
89. Farm and garden	18,396.41	
90. Stables	6,462.17	
91. Dairy and cow barns	5,731.97	
92. Lawns and grounds	4,733.54	
		284,975.40
Increased compensation:		
Support	55,086.30	
General repairs and improvements	3,004.94	
Roadways, grading, and walks	731.61	
Semipermanent buildings	66.63	
		58,889.48
On hand:		
Support	63,212.43	
Buildings and grounds, 1919—		
General repairs and improvements	8,559.43	
Roadways, grading, and walks	58.75	
Railroad-track scale	6,928.23	
Buildings and grounds, continuous—		
Shop and storehouse building	13,685.36	
Isolation building	5,000.00	
Semipermanent buildings	2,848.84	
		100,292.04
		1,369,132.49

Summary of expenditures.

Current expenses:	
Salaries and wages	$362,160.50
Clothing	108,229.01
Subsistence	527,023.59
Ordinary repairs	25,020.96
Office, domestic, and outdoor expenses	15,689.59
	1,038,123.65
Extraordinary expenses:	
Permanent improvements to existing buildings	96,748.13
New buildings	190,508.32
Grand total	1,325,380.10

The report for this year includes expenditures to June 30, 1919, only. The balance of expenditures will be shown in the supplement in next year's report.

	Male.	Female.	Total.
Patients at beginning of fiscal year	2,524	851	3,375
Patients received during the year	1,549	253	1,802
Patients discharged and died during the year	1,352	239	1,591
Patients remaining at end of fiscal year	2,721	865	3,586
Daily average number of patients	2,776	862	3,638
Average number of officers and employees	425	353	778

REPORT OF THE COLUMBIA INSTITUTION FOR THE DEAF

OFFICERS OF THE INSTITUTION.

Patron.—Woodrow Wilson, President of the United States.
President.—Percival Hall, M. A., Litt. D.
Secretary.—Rev. Ulysses G. B. Pierce.
Treasurer.—H. Ralph Burton, Esq.
Directors.—Hon. Atlee Pomerene, Senator from Ohio; Hon. John E. Raker, Member of Congress from California; Hon. Stephen G. Porter, Member of Congress from Pennsylvania, representing the Congress of the United States; Theodore W. Noyes, Esq.; Charles Herbert Stockton, LL. D.; Martin A. Knapp, LL. D.; David Jayne Hill, LL. D., citizens of the District of Columbia; John B. Wight, Esq., and Ernest G. Draper, citizens of New York; the president and the secretary of the institution.

FACULTY AND OFFICERS OF GALLAUDET COLLEGE, 1918–1919.

President and professor of applied mathematics and pedagogy.—Percival Hall, M. A., Litt. D.
Vice president and professor of languages.—Edward Allen Fay, M. A., Ph. D., Sc. D., Litt. D.
Professor of English and history.—John Burton Hotchkiss, M. A., Litt. D.
Professor of natural science.—Charles Russell Ely, M. A., Ph. D.
Professor of English and biology.—Herbert E. Day, M. A.
Professor of mathematics and engineering.—Isaac Allison, E. E.
Professor of Latin and English.—Elizabeth Peet, B. A.
Librarian and instructor in mathematics and gymnastics.—Helen Northrop, B. A.
Assistant professor of Latin and natural science.—Victor O. Skyberg, M. A.
Instructor in mathematics and physical director.—Frederick H. Hughes, M. A.
Instructor in agriculture.—Harley D. Drake, B. A., M. S.
Emeritus instructor in drawing.—Arthur D. Bryant, B. Ph.
Instructor in English and history.—Irving S. Fusfeld, M. A.
Instructor in applied art and drawing, and in charge of college women.—Charlotte E. Weiss.
Instructor in printing.—Altamont M. Rogers.
Registrar and secretary to the president.—Lois I. Herrington.

DEPARTMENT OF ARTICULATION AND NORMAL INSTRUCTION, 1918–1919.

In charge.—Percival Hall, M. A., Litt. D.
Instructors.—Sarah Harvey Porter, M. A.; Annie E. Jameson; Musa Marbut, M. A.
Normal students.—Ida Gaarder, Iowa State Teachers College, Iowa; Agnes E. Suman, Central High School, Washington, D. C.; Rose Woodward, Morganton High School, Morganton, N. C.

FACULTY AND OFFICERS OF THE KENDALL SCHOOL, 1918–1919.

President.—Percival Hall, M. A., Litt. D.
Principal.—Arthur L. Roberts, M. A.
Instructors.—Musa Marbut, M. A., supervising teacher of oral classes; Helen Fay; Grace D. Ely; Margaret Compton; Edith M. Nelson, M. A.
Instructor in art and manual training.—Margaret E. Wafter.
Instructor in sewing and cooking.—Agnes E. Suman.

DOMESTIC DEPARTMENT, 1918–1919.

Supervisor and disbursing agent.—Louis L. Hooper, M. A.
Attending physician.—Harry H. Donnally, M. D.
Matron, Gallaudet College.—Mrs. Cora V. Troup.
Girls' matron, Kendall School.—Mrs. Carrie R. Timberlake.
Boys' matron, Kendall School.—Mrs. Arthur L. Roberts.
Girls' supervisor.—Virginia Haywood.
Boys' supervisor.—Robert Fuller[1]; Gerald Ferguson.
Master of shop.—Norman Herrington.
Gardener.—Edward Mangum.
Farmer.—Harley D. Drake, B. A., M. S.
Chief engineer.—William J. Muir.

[1] Resigned during the year.

REPORT OF THE COLUMBIA INSTITUTION FOR THE DEAF.

COLUMBIA INSTITUTION FOR THE DEAF,
Kendall Green, Washington, D. C., September 1, 1919.

SIR: During the fiscal year July 1, 1918, through June 30, 1919, there were under instruction in the advanced department of the institution, known as Gallaudet College, 63 men and 43 women, a total of 106, representing the District of Columbia, Canada, and 32 States. This is a decrease of 8 compared with the preceding year.

In the primary department, known as Kendall School, there were under instruction 23 boys and 28 girls, a total of 51. This is a decrease of 2 compared with the preceding year. Of the total in this department, 36 were admitted as beneficiaries of the District of Columbia.

There were admitted to the institution 32 males and 21 females; discharged 16 males and 10 females.

A list of names of students and pupils who have been under instruction since July 1, 1918, and a list of those admitted for the school year 1919–20, will be found appended to this report.

HEALTH.

The epidemic of influenza, which prevailed throughout a large part of the United States in the fall and winter of 1918, visited our institution at the opening of the term. It is probable that it was brought by one or more of the new students. There were approximately 75 cases among the students and pupils of the institution altogether. Several cases were severe, and one young man in the preparatory class, James Tamisiea, of Nebraska, died from bronchopneumonia as a result of the disease.

Considering the difficulties in obtaining nurses and the fact that a number of our employees were ill at the same time that students and pupils were suffering, I believe that the institution was fortunate in having but one fatality among those stricken.

The epidemic made necessary the suspension of work of the collegiate department for a period of two weeks and the lengthening of the Christmas holidays of the primary department. All of this work, however, was made up during the regular school year. There were no other cases of serious illness among the students besides those affected by influenza except one case of scarlet fever.

CHANGES IN THE CORPS OF OFFICERS AND TEACHERS.

At the close of the school year, Miss Musa Marbut, a successful teacher in the primary department, gave up her position to take charge of the oral work of the State School for the Deaf at Staun-

ton, Va. Her place was filled by the appointment of Miss Grace D. Coleman, B. A., a graduate of our own normal class, who has taught with success for two years at the Rhode Island Institute for the Deaf.

Miss Helen Northrop, a graduate of the collegiate department, and librarian and instructor in mathematics and gymnastics, also resigned. Her place is filled by the promotion of Miss Edith Nelson, M. A., graduate of the college.

The vacancy caused by the promotion of Miss Nelson was filled by the appointment of Miss Ida Gaarder, who was trained in our normal class during the school year.

Miss Margaret Compton, also of the primary department, resigned to return to the Colorado School for the Deaf. Her place has been taken by Miss Mary Deem, who has had three years' teaching experience in schools for the deaf.

Mrs. C. R. Timberlake, matron of the girls of the Kendall School, resigned at the end of the fiscal year. Her place has been filled by the appointment of Miss Iona White, formerly matron of the Kansas School for the Deaf.

COURSE OF INSTRUCTION.

The course of instruction, as reported last year, was carried out with the additional requirement of drawing from preparatory students. Otherwise the course has remained unchanged.

By the vote of the faculty, the granting of other baccalaureate degrees than Bachelor of Arts and Bachelor of Science after the year 1920 will be abolished.

A very large majority of the young women of the college have petitioned for the addition of instruction in domestic science. In the estimates for the fiscal year to end June 30, 1921, provision has been made for a teacher in this subject.

LECTURES.

The following special lectures have been delivered during the year:

IN THE COLLEGE.

The League of Nations	Dr. Fay
Socialism	Dr. Hotchkiss
Collecting Butterflies and Moths	Dr. Ely
Our Southern Highlands	Professor Day
Currents	Professor Allison
Our Hall of Fame	Miss Peet
Some Libraries and their Books	Miss Northrop
The Record of the 27th Division in Belgium and France	Mr. Skyberg
The Amateur Spirit	Mr. Hughes
Child Labor in the United States	Mr. Fusfeld
The District of Columbia	Mr. Drake

IN THE KENDALL SCHOOL.

Patriotism	Mr. Roberts
Rip Van Winkle	Miss Gaarder
Spies and Snipers	Miss Nelson
Aladdin	Miss Woodward

FINANCES.

Statement by the disbursing agent of receipts and expenses for the fiscal year ending June 30, 1919.

	Receipts.	Expenses.
COMMISSARY STORES.		
Salaries		$722.50
Supplies		126.86
Equipment		26.92
Merchandise		10,678.17
Sundries	$1.65	4.56
Merchandise	43.30	
Total	44.95	11,559.01
FARM (1).		
Salaries		2,790.31
Supplies	2.17	465.70
Feed	9.68	6,602.84
Plants and seeds		304.67
Equipment		296.43
Live stock		441.86
Care of live stock		101.39
Sundries		142.59
Repairs		540.87
Sundries	134.00	
Milk	2,368.65	
Fruits and vegetables	30.92	
Live stock	391.05	
Poultry and eggs	210.54	
Total	3,147.02	11,689.66
IMPROVEMENTS, RENEWALS, AND REPAIRS.		
Salaries	.50	5,261.87
Supplies	116.19	3,129.24
Equipment		37.25
Contract	4.10	2,182.52
Total	120.79	10,610.88
KENDALL SCHOOL.		
alaries		10,062.33
Supplies		254.11
Food		1,980.97
Equipment	1.00	232.07
Doctors and medicines		360.91
Tuition	3,880.00	
Sundries	3.54	99.98
Total	3,884.54	12,910.70
NORMAL DEPARTMENT.		
Salaries		1,018.00
Sundries		20.00
Total		1,038.00
OFFICE AND ADMINISTRATION.		
Salaries		8,622.20
Supplies		66.38
Equipment		657.42
Sundries		25.87
Communication service	46.51	962.22
Total	46.51	10,334.09
HEAT, LIGHT, AND POWER.		
Salaries		1,910.98
Supplies		128.63
Coal	2.00	8,488.28
Gas		882.58
Equipment		41.23
Sundries		71.80
Total	2.00	11,523.50
AUTOMOBILES.		
Salaries		$707.00
Supplies		528.29
Gasoline and oil	$5.42	593.59
Equipment		115.16
Sundries	1.77	119.60
Repairs		329.07
Total	7.19	2,392.71
GALLAUDET COLLEGE.		
Salaries	7.43	30,278.66
Supplies	5.60	781.53
Food	5.44	8,074.51
Equipment	2.50	975.72
Doctors and medicines	98.19	1,171.86
Tuition	3,775.00	
Sundries	1.00	278.66
Library		356.00
Laboratory	4.00	161.74
Printing plant	1,615.00	720.22
Total	5,514.66	42,798.90
LAUNDRY.		
Salaries		2,560.40
Supplies		16.80
Equipment		28.01
Sundries		29.40
Do	18.95	
Total	18.95	2,634.61
PARKING.		
Salaries		3,975.18
Supplies		489.56
Equipment		54.70
Sundries		105.38
Contracts and teaming		
Board and care of horses		11.50
Sundries	264.31	
Total	264.31	4,636.32
MISCELLANEOUS.		
Merchandise		601.46
Sundries		1,070.56
Traveling	53.03	229.59
United States appropriations	108,316.05	
Sundries	1,456.36	
Merchandise	669.45	
Total	110,474.89	1,901.61
Grand total	123,525.84	124,029.69
RECAPITULATION OF RECEIPTS AND EXPENSES.		
Salaries	7.93	67,909.43
Supplies	146.50	32,894.54
Equipment	3.50	2,906.77
United States appropriations	108,316.05	
Tuition	7,655.00	
Sundries	6,684.11	9,039.32
Merchandise	712.75	11,279.63
Total	123,525.84	124,029.69
Total receipts	123,525.84	
Total expenses		124,029.69
Cash on hand, July 1, 1918	1,987.48	
Cash on hand, June 30, 1919		1,483.68
	125,513.32	125,513.32

RECAPITULATION OF RECEIPTS AND EXPENSES.

NOTE.—Besides the regular receipts and expenses of the year, there are included in the above statement the following:

(*a*) $2,318.29 received July 2, 1918, on account of the 1917–18 appropriation.
(*b*) $2,639.25 expended July 5, 1918, on account of the 1917–18 appropriation.
(*c*) $1,279.65 expended August 6, 1919, on account of the 1918–19 appropriation.

(1) The account for the year of the farm in its relation with the other parts of the institution was as follows:

DEBITS.

Board and laundry of farm hands	$345.50
Repairs	568.86
Sundries	109.55
Total	1,023.91

CREDITS.

Milk	5,412.20
Board of horses	288.00
Fruit and vegetables	410.33
Live stock	580.71
Poultry and eggs	1,357.76
Sundries	82.59
Total	8,131.59
Total debits	$1,023.91
Total credits	8,131.59
Credit balance	7,107.68

Statement of the Treasurer for the Fiscal Year ending June 30, 1919.

GENERAL FUND.

1918.			
July 1.	By balance		$316.69
	By 2 Chesapeake & Potomac Telephone Co. coupons, at $25		50.00
	By 8 Chesapeake & Ohio Railway Co. coupons, at $22.50		180.00
	By 2 Riggs Realty Co. coupons, at $12.50		25.00
	By 4 Liberty bond coupons, at $10		40.00
	By 6 months' interest to Dec. 31, 1918, on balance, Union Trust Co		11.91
	By 6 months' interest to June 30, 1919, on balance, Union Trust Co		6.41
Dec. 31.	To H. Ralph Burton, bookkeeping expenses, treasurer's office, to Dec. 31, 1918	$50.00	
1919.			
Mar. 18.	To Percival Hall, president, account of general expenses	300.00	
Apr. 22.	To Union Trust Co., rent of safe deposit box to Apr. 6, 1920	4.00	
May 6.	To American Surety Co., of New York, premium on bond of treasurer to Mar. 19, 1920	25.00	
June 30.	To balance	[1]251.01	
		630.01	630.01

MANUAL LABOR FUND.

1918.			
July 1.	By balance		$547.90
	By 8 Southern Railway Co. coupons, at $25		200.00
	By 2 Chesapeake & Ohio Railway Co. coupons, at $22.50		45.00
Mar. 18.	To Percival Hall, president, account of salary of manual training teacher	$700.00	
June 30.	To balance	[1] 92.90	
		792.90	792.90

MEMORIAL ART FUND.

1918.			
July 1.	By balance		$ 98.18
	By 1 United States 1898 coupon, at $0.75	.75	
	By principal of 1 United States 1898 3 per cent bond No. 49170		100.00
	By 2 Washington Railway & Electric Co. coupon, at $10		20.00
	By 1 Liberty bond coupon, at $2.02		2.02
Dec. 16.	To 1 United States 4¼ per cent, fourth issue, Liberty bond No. 2567028	$100.00	
1919.			
June. 30.	To balance	120.95	
		220.95	220.95

Summary of balances, June 30, 1919.

General fund	[1] $251.01
Manual labor fund	[1] 92.00
Memorial art fund	120.95
Total	464.86

ESTIMATES FOR THE FISCAL YEAR ENDING JUNE 30, 1921.

The following estimates for the fiscal year to end June 30, 1921, have already been submitted:

For the support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, $110,250.

For repairs to the buildings of the institution, including plumbing and steamfitting, and for repairs to pavements within the grounds, $10,000.

For painting and equipping new women's dormitory building and finishing grading and walks adjacent thereto, $7,000.

For the purchase of 6.2 acres of land between Montello Avenue, West Virginia Avenue, and the northeast boundary of the grounds of the institution, at present belonging to Richard E. Pairo, $12,000.

For the purchase of automobile truck, $2,000.

During the past year the number of free scholarships allowed in the advanced department was increased from 100 to 125. The number of students for the fiscal year to end June 30, 1920 will be the largest in the history of the institution. There is every reason to believe that all of the free scholarships will be taken up in another year, and this fact, together with the need of a teacher in domestic science and the necessity of increasing the inadequate salaries paid to all employees, necessitates the small increase of $4,250 asked in the current appropriation over last year.

[1] $300 unexpended returned to general fund, and $700 withdrawn from manual-labor fund returned and entered July 2, 1919.

While $7,500 has been allowed for special repairs and improvements during the coming fiscal year, as against $6,000 usually allowed, the cost of materials and labor has increased from 50 to 100 per cent in the past few years. The buildings and roadways of the institution are suffering for lack of repairs at the present time. The estimated value of these buildings is at least $600,000, and $10,000 per annum is the minimum amount which should be spent for repairs alone to keep up the buildings of the institution in the proper manner. Walks and roadways also need attention. It will be a matter of poor economy to allow deterioration of the plant now used by the institution, and if such deterioration is not to take place, it is absolutely necessary to increase the amount allowed for repairs and improvements.

The fine new dormitory provided by Congress for our young women has never been completed, as far as painting of the walls, entire equipment of rooms, and grading about the building go. The sum of $7,000 is very much needed to take care of these items and to finish in a proper and complete manner the splendid building now in use by the young women of the college.

On the northeast boundary of our grounds there is at present a tract of 6.2 acres of land containing only one dwelling house, which, in the near future, is likely to be subdivided and built upon. This land borders on Montello Road, West Virginia Avenue, and our northeast boundary. Its acquisition by our institution would set most desirable limits to our institution grounds, would add much needed territory to our farm land, and would prevent undesirable building in the immediate neighborhood of our institution. I believe the purchase of this tract would be of great benefit to our institution in the near future.

The sum of $2,000 is asked for the purchase of a small automobile truck equipped to handle with economy the considerable hauling necessary in such an institution as ours.

EXERCISES OF PRESENTATION DAY.

The fifty-fifth public anniversary of the collegiate department was held in the college chapel on Wednesday, May 7. Dr. John Brittan Clark, of the First Presbyterian Church, offered the opening prayer.

Orations given by members of the graduating class were as follows:

The Promise of the South, Claude Venable Ozier, of Tennessee.
Light in Darkness, Mabel Marguerite Kau, of Oregon.

Candidates for degrees were presented by President Hall, Vice President Fay, and Dr. Ely, as follows:

For the degree of master of arts.

Franklin Charles Smielau, B. A. 1897, Gallaudet.

For the degree of bachelor of arts.

Sanford Robey Burns.
Mabel Marguerite Kau.
Thomas Watson Osborne.
Claude Venable Ozier.
Forrest Rundel Peard.
Jeannette Wolverton.

For the degree of bachelor of philosophy.

Frank Henry Dohrmann.
Gerald Joseph Ferguson.
Harry Wroth Hetzler.
Maria Margaretha Kallenbach.
Lula Watts.

For certificate of graduation.

Ruth Cornelia Atkins.
Mamie Louise Wallace.

Normal students.

Ida Gaarder, Iowa State Teachers College.
Agnes E. Suman, Central High School, Washington, D. C.
Rose Woodward, Morganton High School, N. C.

The Hon. Wesley L. Jones, Senator from Washington, delivered the address to the graduating class and friends of the college.

A recitation of "America" in the sign language was given by Miss Florence Lewis, of Connecticut, a student in the college.

The benediction was pronounced by Rev. Arthur D. Bryant, Baptist minister to the deaf in Washington.

CONFERRING OF DEGREES.

On the closing day of the term, June 18, 1919, degrees and certificates were conferred in accordance with the recommendations of presentation day, and, in addition, the degree of master of arts, in course, was granted to Grover C. Farquhar, of the class of 1913.

All of which is respectfully submitted.

PERCIVAL HALL,
President.

The SECRETARY OF THE INTERIOR,
Washington, D. C.

APPENDIX A.

CATALOGUE OF STUDENTS AND PUPILS, BY STATES, 1918–1919.

IN THE COLLEGE.

Arizona:
- Bible, Lenore

Arkansas:
- Wallace, Mamie

California:
- Guire, Oscar
- Valiant, Walter
- Whitworth, George

Colorado:
- Barnett, Vern
- Frewing, Robert
- Lawver, Esther
- Teitelbaum, Bernhard
- Wilson, Powell

District of Columbia:
- Werdig, Robert

Florida:
- Randall, Laurence

Illinois:
- Burns, Robey
- Cherry, Ladislaw
- Cohen, Jacob
- Peard, Forrest

Iowa:
- Hanson, Harold
- Marty, John
- Rebal, Frank

Kansas:
- Atkins, Ruth
- Dohrmann, Frank
- Ferguson, Gerald
- Houze, Clyde
- Linton, Pearl
- Paxton, Lawrence
- Wolverton, Jeannette

Kentucky:
- Aronovitz, Louis
- Kannapell, Gordon
- Kannapell, Robert
- Tuck, Sara

Louisiana:
- Courrege, Armand

Maryland:
- Baynes, Harry
- Downes, Noah
- Hetzler, Wroth
- Leitch, Ruth
- Moss, Elizabeth
- Moss, Helen

Massachusetts:
- Cohen, Blume

Michigan:
- Maczkowski, Earl

Minnesota:
- Earsley, Etta
- Lauritsen, Wesley
- Lindholm, Toivo
- Post, Eunice
- Rosen, Alex
- Werner, Maurice

Mississippi:
- Breazeale, John
- Hume, Boyd

Missouri:
- Toner, Isabelle

Montana:
- Patrick, Henry

Nebraska:
- Anderson, Edith
- Birk, Cecelia
- Jensen, Mine
- Kilcoyne, Catherine
- Maxwell, Estella
- Tamisiea, James[1]

New Jersey:
- Dobbins, Charles
- Higgins, Matthew

New York:
- Funk, John
- Herdtfelder, August
- Lewis, Gertrude
- May, William
- Orman, James
- Pusrin, Bella
- Rozboril, Matthew

North Dakota:
- Francis, Doris
- Haley, Wendell

Ohio:
- La Fountain, Lewis
- Pence, Helen
- Sattler, Madeline

Oklahoma:
- Logan, Mary
- Nanney, Nora
- Wilcoxson, Ella

Oregon:
- Dodd, Julia
- Kau, Marguerite

Pennsylvania:
- Connor, Fred
- Davies, George
- Flenner, Miriam
- Harmon, Edward
- Harmon, Marion
- Sterck, Emily

[1] Died October 6, 1918.

Pennsylvania—Continued.
Stilwell, Helen
Zielinski, Leo
South Carolina:
Boatwright, Sophie
Clarkson, Ella
Hartin, Archie
South Dakota:
Mills, Anson
Sauvage, Esther
Tennessee:
Lucado, Prentis
Osborne, Watson
Ozier, Claude
Rittenberg, Sam
Shawl, Arthur
Texas:
Stevens, Kelly
Washington:
Deer, Dewey
McNeal, Edwin
West Virginia:
Watts, Lula
Whitehead, Maurice
Wisconsin:
Bausch, Anna
Hansmann, Meta
Kallenbach, Mary
Canada:
McShane, Muriel
Matthew, Gordon
Nicholson, Ethelwynne

Total in the college 106

IN THE KENDALL SCHOOL.

Canada:
Rosenroll, Richelda
Stinson, Kathleen
Delaware:
Ellingsworth, Ida
Lynch, Edward
Roberts, Pearl
District of Columbia:
Ball, Annie
Berman, Frank
Bostwick, Mabel
Cicchino, Tony
Cissel, Willie
Covington, Alice
Craven, Jack
Crump, Edward
Culverwell, Esther
Curtis, Raymond
Dolan, John
Dunn, Delma
Glorius, Frances
Higgins, Thelma
Kleindienst, Maurice
Looney, Thomas
Miller, Frances
Miller, John
Miller, Mildred
Minter, Lee
Moore, Agnes
Moore, Cecil
District of Columbia—Continued.
Neitzey, Annie
Norcia, Rosie
Obermiller, Grant
O'Neill, Virgie
Panholzer, Mary
Pearson, Pearl
Pierce, Edith
Pucci, Luiggi
Raftery, William
Reed, Florence
Rodeheaver, Margaret
Scott, Carlisle
Stancliffe, Walton
Sullivan, Charles
Wheeler, Clara
Wuerdemann, John
Kansas:
Lahn, Nathan
Vaughan, Waite
New York:
McLaren, Bruce
Tennessee:
Lucado, Ida
Virginia:
Angel, Virginia
West Virginia:
Gollner, Catherine
MacVeigh, Helen Louise
Smith, Kathleen

Total in the Kendall School 51

APPENDIX B.

FACULTY AND OFFICERS OF GALLAUDET COLLEGE, 1919–1920.

President and professor of applied mathematics and pedagogy.—Percival Hall, M. A., Litt. D.
Vice president and professor of languages.—Edward Allen Fay, M. A., Ph. D., Sc. D., Litt. D.
Professor of English and history.—John Burton Hotchkiss, M. A., Litt. D.
Professor of natural science.—Charles Russell Ely, M. A., Ph. D.
Professor of English and biology.—Herbert E. Day, M. A.
Professor of mathematics and engineering.—Isaac Allison, E. E.
Professor of Latin and English.—Elizabeth Peet, B. A.
Assistant professor of Latin and natural science.—Victor O. Skyberg, M. A.
Instructor in mathematics and physical director.—Frederick H. Hughes, M. A.
Instructor in agriculture.—Harley D. Drake, B. A., M. S.
Emeritus instructor in drawing.—Arthur D. Bryant, B. Ph.
Instructor in English and history.—Irving S. Fusfeld, M. A.
Instructor in applied art and drawing, and in charge of college women.—Charlotte E. Weiss.
Librarian and instructor in gymnastics.—Edith Nelson, M. A.
Instructor in printing.—James Y. Johnson.
Registrar and secretary to the president.—Lois I. Herrington.

DEPARTMENT OF ARTICULATION AND NORMAL INSTRUCTION, 1919–1920.

In charge.—Percival Hall, M. A., Litt. D.
Instructors.—Sarah Harvey Porter, M. A., Annie E. Jameson, Arthur L. Roberts, M. A.
Normal fellows.—Leslie M. Brown, B. A., Dartmouth College; Olive J. Whildin, B. A., Goucher College.

FACULTY AND OFFICERS OF THE KENDALL SCHOOL, 1919–1920.

President.—Percival Hall, M. A., Litt. D..
Principal.—Arthur L. Roberts, M. A.
Instructors.—Helen Fay, Grace Ely, Grace Coleman, B. A., Mary Deem, Ida Gaarder.
Instructor in sewing and cooking.—Agnes E. Suman.
Instructor in art and manual training.—Margaret E. Wafter.

DOMESTIC DEPARTMENT, 1919–1920.

Supervisor and disbursing agent.—Louis L. Hooper, M. A.
Attending physician.—Harry H. Donnally, M. D.
Dentist.—Elliott Hunt, D. D. S.
Matron, Gallaudet College.—Mrs. Cora V. Troup.
Boys' matron, Kendall School.—Mrs. Arthur L. Roberts.
Girls' matron, Kendall School.—Miss Iona White.
Girls' supervisor.—Ruth Atkins.
Boys' supervisor.—Robey Burns.
Master of shop.—Norman Herrington.
Gardener.—Edward Mangum.
Farmer.—Harley D. Drake, B. A., M. S.
Chief engineer.—William J. Muir.

STUDENTS AND PUPILS ADMITTED, 1919–1920.

IN THE COLLEGE.

Alabama:
Franke, Emma
Harrell, Josephine
Rollings, Ollie
California:
Benedict, Edwin
Connecticut:
Santin, Mario
Florida:
Jones, Uriel
Wilson, Lalla
Kansas:
Lahn, Nathan *
Stewart, George
Maryland:
Daley, Alma
Minnesota:
Lauritzen, Thomas
Mississippi:
Gotthelf, John
Marshall, Maude
Montana:
O'Donnell, Arthur
Nebraska:
Jensen, Mine
Horn, Gertrude
Lee, Fred
Netusil, Anton
North Carolina:
Thomas, Carrie
New York:
Kirby, John
Ohio:
Durrant, Dorothy
Glaser, Corrine
McConnell, Eugene
Ohio—Continued.
Risley, Gladys
Toskey, Katherine
Williams, Roger
Oklahoma:
Griffing, Theodore
Stephens, Alfred
Pennsylvania:
Hassett, Elizabeth
Klaits, Mary
Markel, Harland
Miller, Gertrude
Rogalsky, Samuel
Schrager, Charles
Zimble, Nathan
South Carolina:
Boatwright, John
Bradley, Isabelle
Edwards, Weimona
Smoak, Frank
Tennessee:
Lucado, Ida
Washington:
Genner, Andrew
Robinson, Genevieve
Seipp, John
Wisconsin:
Bristol, Gordon
Langenberg, Ernest
Weiss, Leonard
Canada:
McShane, Muriel
Nicholson, Ethelwynne
Rosenroll, Richelda *
Stinson, Kathleen *
Creighton, Lucy

Total 51

IN THE KENDALL SCHOOL.

District of Columbia:
Coe, William
De Grange, Arietta
Hill, Dorothy
Hospital, J. Dixon, jr.
McCall, Rozelle
Miller, Thomas
Lowe, Grace
Ramsay, William
Sharp, Evelyn.
Sharp, William.
Watson, George
District of Columbia—Continued.
Zimmerman, Woodrow
North Carolina:
Wolfe, Walker
Ohio:
Krohngold, Maurice
Virginia:
Penn, John
Canada:
Isherwood, Dorothy
Paulson, Esther
Young, John

Total 18

* From the Kendall School.

APPENDIX C.

ADDRESS OF HON. WESLEY L. JONES, UNITED STATES SENATOR FROM WASHINGTON, AT THE FIFTY-FIFTH ANNIVERSARY, GALLAUDET COLLEGE, PRESENTATION DAY, WEDNESDAY, MAY 7, 1919.

Mr. President, Young Ladies and Gentlemen of the Graduating Class, and Friends: I do not know that my performance really justifies the statement that the Doctor has made to you. I think not. He said that I had taken a great interest in the deaf people throughout the country. It is true I am interested in them, but this is the first time that I have had the pleasure of visiting this institution and I have been coming to Washington for about 20 years, and I have no good excuse for my negligence.

I am certainly glad that I have the opportunity to come here to-day and glad to see so many of your friends here and so many in this graduating class. I congratulate you upon coming so near to the end of your college course. I understand that this is preliminary to your actual graduation in a month or two from now.

I am pleased to note that you are keeping up a custom that was followed generally about the time I was going through school; that is, that on graduation days you have members of the graduating class deliver addresses rather than expect some one from the outside to come in and take all the time. That is a very fine custom. I have regretted that at many graduating exercises I have attended they have apparently depended on the outside speaker to take up the time to tell the graduating class all that there was to learn and all that there was to know, instead of giving the young men and women who have just been learning of everything and who are in the frame of mind to feel that they can solve about every problem under the sun an opportunity to give their solution of these problems. I know that young men and women just completing a course in college do have a great many ideas that are better and they can express them a great deal better than those who have been out of school for a long time. In the buoyancy, confidence, and hopefulness of youth there is no problem they can not solve on graduation. They may never feel that way again and I am glad you recognize this by keeping up this custom. I wish more of our colleges would do it.

I have not come here with a splendid oration like those that have been delivered to-day. I could not give you as fine, splendid, and polished orations as those if I tried. If I had had one when I came the exercises have been so interesting to me that it would have been gone by this time.

I must say that I never was so interested in any graduation exercises as I have been to-day. I mean what I say when I state that the orations that have been delivered were most interesting, expressed in a splendid sort of way, and contained thoughts that were well worthy of more mature minds and intellects. They were an in-

spiration to everyone who has the interests of this institution and of your people at heart.

As I said, I have not come with any special oration or address. I come with just a little message of encouragement, just a few words that I hope may be of real benefit to these young men and these young women in the contest of life into which they are soon to enter.

You sometimes hear people say that there are no opportunities for young men and young women now; that it is not like it used to be long years ago. Well, it is not like it used to be long years ago, but it is not true that there are no opportunities for young men and young women now. I do not believe that in the history of the world there was ever a time when there were such opportunities for work and accomplishment for young men and young women as there are now. These young men and young women just getting through school should start into the contest of life with all sorts of optimism, because there are opportunities that will come to you that did not come to those of the past. The field of endeavor, of real accomplishment for women and for men is broadening in every line of human activity. Great institutions are looking for men and women to do their work, and develop them, carry them on, and maintain them. The door of opportunity is open wider to-day than ever before.

There is no reason why any boy or girl should be discouraged because you may not have just the things you would like to have. You don't need money, you don't need influence to be a success. Observation and experience largely show that the more young men or young women have when they start in the contest of life, the more likely they are to make a failure. This ought not to be, but it seems to be a fact. It is very desirable to have money, wealth, and all that sort of thing, if you use it rightly. The trouble seems to be that those who have it lose their ambition, lose their energy, and make no use of the instruments that they have and the opportunities that present themselves to them.

Every boy and every girl hopes for success in life, hopes to accomplish something, to make something out of themselves, and I want to leave just this message with you: Every boy and girl can start out in the contest of life with every element and every asset that is necessary to bring real, genuine success. It does not take money. It does not take position. It does not take influential friends.

What are the assets? What constitutes the assets really necessary for success? Honesty, integrity, industry, determination, frugality, faithfulness. These are the elements that will bring real success. Every boy and every girl can start out with them. I can not give them to you. Wealth can not give them to you. Your friends can not; nobody can give them to you. You must be those things, and you can be if you will. You must be honest, if you are honest. You must be industrious, you must be faithful, and you must be determined. No one can make you these things. It depends on yourself.

One other essential to success is to do what your hands find to do, remembering always that honest toil is honorable. It is well to set your hopes and your ambitions upon what you may consider a high calling and great things. But do not forget that, in order to obtain

the goal, you have to start at the bottom. You may have to do a great many things that you do not like to do, you may have to do a great many things that are not very pleasant to do, you may have to do a great many things that are not very desirable to do, to attain your goal. But if they are honest things, they are honorable, however lowly or undesirable, and if it is necessary to do these things in order to attain the goal, do them.

Out in our country, when we climb a mountain, we do not begin at the top. We begin at the bottom. In order to climb a ladder you have got to take the first step to the first round and then on to the next and the next before you get to the top.

Now I am going to give you a little story to illustrate the idea that I want to impress upon you, and that I want to leave with you. If you do not remember anything else that I have said you may just remember it. You can apply it, and you can amplify it, and you will find if you practice what it teaches that it will bring success.

We had a young man out in my country named John, who wanted to be the president of a bank. That was his ambition. He had gone through school, had studied banking and finance, and he thought he was competent to solve almost any problem in the banking world. He felt that he knew more about banking and finance than almost anybody else. That was all right. It is a mighty good thing to think that you know something, that you can do things, and have confidence in yourself. When John got through school and came home he thought the way to do was to ask for the position. That is right, too. You must go after things. They don't hunt for you, as a rule. He went to the directors of the bank and said, "Gentlemen, I am just through school, I have taken a course in banking, finance and currency, and I know all the principles of banking. I want to be president of your bank."

The president of the board looked at him. "Well, John, that is really a little surprise to us, but I haven't any doubt that you would be able to run this bank all right. We would like awfully well to avail ourselves of your ability and services, but," he said, "the man that is president of the bank has been president for a long time. He has rendered us good, honest, faithful service, and we hardly see how we can put him out. We may have a vacancy in the presidency some of these days, and then we will be glad to see you, and glad to consider your claim. I am sorry we can't do this for you." As John was turning to go out the president said to him, "There is one place, however, that is vacant. We really would like to have somebody to fill it, but you probably would not like that and so I hesitate to suggest it to you." John said, "What is it?" "Well, we want somebody to sweep out." John said, "I will do it." He took the job, and he swept out well. He was always there early in the morning, and he swept out in a way that would have pleased the ladies—he swept out the corners, and way under the tables. He did a fine job; he did it well and faithfully. He was always there on time, one of the last boys to leave in the evening, industrious, frugal, saving, temperate, of good character, attended to his business, and seemed to think that the success of the bank depended on him and the way he swept out.

That is just exactly the way you boys and girls must put yourselves into the work that you do. Make those that you are working

for think that you believe the success of their enterprise depends upon you.

So John kept at this day after day. He did not know whether anybody was paying any attention as to how he swept out or not. The officials of the bank watched. His earnestness impressed them. They saw how faithful he was. They noticed how industrious and careful he was. And by and by there was a vacancy in a clerkship in the bank, and they called John in one day and they said: "John, you have been true, earnest, industrious, faithful, and honest in your work. We appreciate it. We have another place for you that is a little bit better, a little more desirable, pays a little more and we want you to have it." He took it and he was just as faithful in that job as he was in the other. By and by, after some years, during which he rose from one position to another, a vacancy occurred in the presidency of the bank, and the directors called John in and said: "John, many years ago you came here and asked to be made president of this bank. We could not do it then and you took the humblest position in the bank. You have filled all the positions that came, from the bottom to the top, and you filled them faithfully, honestly, and well. We know that we can intrust the care and the business of this institution in your hands, and now we are ready to make you president of this bank," and John is president of that bank to-day.

He did not get it through influence. He did not get it through power. He did not get it by accident. He got it by faithful, earnest, honest work. That will bring success in every vocation in life. Where did John make his greatest success? He is no greater success as president of the bank to-day than he was when he swept out. The real test of John's character, the real test of his make-up, the real step toward success was when he took the position to sweep out. The greatest decision that he ever made in his life was the decision to accept that position. Sweeping out is just as honorable as being president, but it may not be as desirable.

If you want to be president of a bank, and it is necessary for you to sweep out in order to get there, sweep out. And so it is with any object that you seek in life. You may have to do something that is not desirable. But if it is honest, it is honorable, and it may be the only means to success.

So let me just leave this message with you boys and girls. You will always find those who recognize honesty, faithfulness, integrity, sobriety and real, genuine manhood and womanhood. The great industries, institutions, and positions of this country to-day are seeking men and women with these assets. So if you want to succeed—and everyone does—do the honest thing that comes to your hands. Do it faithfully, honestly, and energetically, and the reward will be even beyond your expectation.

I hope for each and every one of you the very greatest success in life, but no matter what I hope nor what your friends hope, what you accomplish depends almost entirely upon yourself. [Applause.]

APPENDIX D.

REGULATIONS.

1. The academic year is divided into three terms, the first beginning on the last Thursday in September and closing on the 24th of December; the second beginning the 29th of December and closing the next to the last Friday in March; the third beginning on the following Monday and closing the Wednesday before the last Wednesday in June.

2. The vacation is from the Wednesday before the last Wednesday in June to the last Thursday in September.

3. There are holidays at Thanksgiving, Christmas, Washington's Birthday, Easter, and Decoration Day.

4. Pupils may visit their homes during the regular vacation period and on the above-named holidays, but at no other time unless for some special urgent reason, and then only by permission of the president.

5. The bills for the maintenance and tuition of pupils supported by their friends must be paid semiannually in advance.

6. The charge for pay pupils is $400 per annum. This sum covers all expenses in the primary department except clothing and extraordinary medical attention, and all in the college except clothing, books, and extraordinary medical attention.

7. All deaf-mutes of teachable age, of good mental capacity, and properly belonging to the District of Columbia are received without charge. To students from the States and Territories, who have not the means of defraying all the expenses of the college course, the board of directors renders such assistance as circumstances seem to require, so far as the means at its disposal will allow.

8. It is expected that the friends of the pupils will provide them with clothing, and it is important that upon entering or returning to the institution they should be supplied with a sufficient amount for an entire year. All clothing should be plainly marked with the owner's name. The students are required to furnish their own towels.

9. All letters concerning pupils or applications for admission should be addressed to the president.

10. The institution is open to visitors during term time on Thursdays only, between the hours of 9 a. m. and 3 p. m. Visitors are admitted to chapel service on Sunday afternoons at 3.30 p. m.

REPORT OF THE FREEDMEN'S HOSPITAL

ROSTER OF OFFICERS.

STAFF.

W. A. Warfield, M. D., *Surgeon in Chief.*
P. M. Murray, M. D., *Assistant Surgeon.*
N. W. Harris, M. D., *Resident Physician.*
B. Price Hurst, M. D., *Pathologist.*
L. H. Brown, jr., M. D., *Anæsthetist.*

NURSES.

Laura R. MacHale, Registered Nurse, New Jersey, *Superintendent.*
Emma M. Irwin, Registered Nurse, Illinois, *Assistant Superintendent.*
Martha E. Cabaniss, Registered Nurse, Virginia, *Night Supervisor.*
Lulu E. Thompson, Head Nurse.
Elizabeth B. Howland, Head Nurse, Registered Nurse, W. Va.
Bertha J. Thomas, Registered Nurse, Head Nurse, Pennsylvania.

CLERK AND ASSISTANTS.

F. D. Henry, G. S. Jackson (stenographer), M. E. Wormley.

INTERNES.

G. S. Perry, M. D.
Wiley M. Wilson, M. D.
H. D. Armstead, M. D.
William F. Magruder, M. D.
Aaron L. MacGhee, M. D.
John T. Warricks, M. D.
John S. Mitchell, *Pharmacist.*
Charles B. Fisher, M. D.
William H. Harper, M. D.
George W. Adams, M. D.
Chauncey M. D. Harlee, M. D.
James P. McCain, M. D.
George A. Thompson, *Assistant Pharmacist.*

ADVISORY VISITING STAFF.

Edward A. Balloch, M. D.
Edward D. Williston, M. D.
J. E. H. Taylor, M. D.
Wm. A. Jack, M. D.
Jas. J. Richardson, M. D.
J. B. Nichols, M. D.

VISITING STAFF.

INDOOR.

Medical.

Henry P. Parker, M. D.
Caryl Burbank, M. D.
Thomas Martin, M. D.
Robert W. Brown, M. D.
J. B. Nichols, M. D.
Lewis Ecker, M. D.
Assistants: E. J. Watson, M. D.; W. M. Lane, M. D.; E. C. Terry, M. D.

Surgical.

E. A. Balloch, M. D.
Wm. A. Jack, M. D.
J. E. H. Taylor, M. D.
A. M. Curtis, M. D.
Assistants: A. B. McKinney, M. D.; A. L. Curtis, M. D.

Gynecological.

W. A. Warfield, M. D.
Wm. C. McNeill, M. D.
S. L. Carson, M. D.
J. E. H. Taylor, M. D.
H. W. Lawson, M. D.
S. L. Cook, M. D.

Assistants: H. R. Burwell, M. D.; J. W. Ross, M. D.

Obstetrical.

Edward D. Williston, M. D. H. W. Freeman, M. D.
H. F. Kane, M. D.

Ophthalmological.

James C. Dowling, M. D.

Otology and Rhinology.

Jas. J. Richardson, M. D. Assistant: Hamilton S. Martin, M. D.

Neurology.

Tom A. Williams, M. D. Assistants: E. G. Mitchell, M. D.; Harry A. Bishop, M. D.

Genito-Urinary.

H. A. Fowler, M. D. Assistants: Milton A. Francis, M. D.; R. Arthur Hooe, M. D.

Orthopedics.

Wm. G. Erving, M. D.; John Dunlop, M. D. Assistant: Chas. A. Allen, M. D.

Pediatrics.

Wm. J. French, M. D.; Assistant: A. B. McKinney, M. D.

Dental Surgeons.

Geo. H. Butcher, D. D. S.; F. P. V. Barrier, D. D. S.

OUTDOOR.

Medical.

W. E. Lewis, M. D. H. C. Lynch, M. D.
U. J. Daniels, M. D. Lee A. Gill, M. D.
C. A. Tignor, M. D. W. F. Phillips, M. D.
J. F. Dyer, M. D. F. D. Whitby, M. D.
E. J. Watson, M. D.

Minor Surgery.

Wm. A. Jack, M. D.; C. W. Childs, M. D.; A. L. Curtis, M. D.

Ophthalmological.

James C. Dowling, M. D.

Otology and Rhinology.

Jas. J. Richardson, M. D. Assistants: Hamilton S. Martin, M. D.; U. L. Houston, M. D.

Neurology.

Tom A. Williams, M. D. Assistants: E. G. Mitchell, M. D.; Harry A. Bishop, M. D.

Genito-Urinary.

H. A. Fowler, M. D. Assistants: Milton A. Francis, M. D.; Ivy Albert Pelzman, M. D.; R. Arthur Hooe, M. D.

Gynecology.

Wm. C. McNeill, M. D. Assistants: Chas. H. Marshall, M. D.; H. R. Burwell, M. D.; C. J. Young, M. D.

Orthopedics.

Wm. G. Erving, M. D.; John Dunlop, M. D. Assistant: Chas. A. Allen, M. D.

Pediatrics.

John W. Mitchell, M. D.; Marie B. Lucas, M. D.

Dermatology.

H. H. Hazen, M. D. Assistants: C. C. Lathers, M. D.; Wm. J. Howard, M. D.

Tuberculosis.

James T. Blue, M. D.

REPORT OF THE FREEDMAN'S HOSPITAL.

WASHINGTON, D. C., *August 20, 1919.*

SIR: I have the honor to submit the annual report of the Freedmen's Hospital for the fiscal year ended June 30, 1919.

There were many difficult situations during the year, attended with unusual cares and anxieties. The absence of a large percentage of the members of the house and visiting staffs, on account of the war, the increased cost of all supplies used in the hospital, the most unusual labor conditions and the salary question made it exceedingly difficult at times, in the administration of the affairs of the hospital, to maintain that standard of efficiency so easily had three years ago.

That the work of the hospital, under these trying conditions, has been kept to the standard of former years is due to the interested efforts and loyal cooperation of the house and visiting staffs.

WAR ACTIVITIES.

The normal function of the hospital, to some extent, was subordinated to the activities of the war.

Twenty-nine per cent of the members of the house and visiting staffs entered the military service. Ninety-one per cent of the internes enlisted in the Army. The pathological laboratory was used in the training of a few men for similar work in the Army. The wards were open to the men receiving Army training in other institutions. The nursing department and members of the visiting staff conducted community training in first aid, and a member of the visiting staff with the surgeon in chief served as members of the local exemption boards.

PATIENTS.

For convenience, the patients are divided into three classes; indigent District of Columbia, indigent United States, and pay patients.

The total number admitted into the hospital during the year was 3,852, as follows: 1,812 indigent District of Columbia, including 153 births; 1,181 indigent United States, including 116 births; 959 pay patients, including 77 births.

There were 218 remaining in the hospital from the preceding year, making a total of 4,070 indoor patients receiving care and treatment as against 3,892 last year.

As regards the admission of patients, it will be noticed that there were 141 less indigent United States patients received than the preceding year, 95 more District of Columbia, and 350 more pay patients. The growth of the pay patient service is remarkable. During the first year of this service, which was the fiscal year 1913, 171 pay patients were admitted and $3,229.50 received therefrom, while

during the fiscal year covered by this report, 959 pay patients were admitted and $17,878 received. It can be said with much truth that this fund saved the hospital from a deficit.

There were discharged during the year 3,878 patients, of whom 1,836 had recovered from their ailments, 1,350 improved, 252 unimproved, 84 not treated, and 350 died.

The surgical work was heavy, 1,940 operations being performed as against 1,913 past year, with the following results:

Recovered	1,374
Improved	463
Unimproved	20
Died	83

The medical service, on the whole, was satisfactory, notwithstanding the many difficulties experienced during the influenza epidemic on account of the illness of many nurses. It is gratifying, however, to note so few deaths from this cause. All of the nurses recovered.

In the out patient department, 5,335 were treated as follows: Medical, 736; minor surgical, 812; neurological, 76; orthopedical, 169; pediatrical, 376; dermatological, 233; otorhinological, 818; urological, 361; gynecological, 729; ophthalmological, 965; and tuberculosis, 60.

There were 9,940 revisits to the various clinics of this department, of which number 2,548 were for surgical dressing. Contrary to our expectation, there were treated in this department 2,919 less than the preceding year, while there were 204 more received for indoor treatment. The increase of indoor patients was due to the increased number of pay patients.

Patients admitted each year for the past 45 years.

Year ending June 30—		Year ending June 30—		Year ending June 30—	
1875	190	1890	2,392	1905	2,918
1876	319	1891	2,373	1906	2,207
1877	500	1892	2,331	1907	2,366
1878	519	1893	2,422	1908	2,669
1879	642	1894	2,801	1909	2,590
1880	819	1895	2,476	1910	2,740
1881	892	1896	2,596	1911	2,900
1882	1,102	1897	2,815	1912	3,385
1883	1,373	1898	2,355	1913	3,208
1884	1,509	1899	2,374	1914	3,144
1885	1,794	1900	2,427	1915	3,348
1886	1,923	1901	2,414	1916	3,491
1887	2,017	1902	2,408	1917	3,886
1888	1,997	1903	2,677	1918	3,648
1889	2,074	1904	2,797	1919	3,852

STATISTICAL TABLES.

INDOOR SERVICE.

The following tables show, in classified detail, the number of medical and surgical cases admitted, discharged, diagnosis, operations, and results of the indoor patients:

Medical and surgical diseases, except pay patients.

Disease.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Abscesses, infections, ulcers.															
Abscess:															
Alveolar	....	....	....	1	1	2	1	1	....	....	....	2	15	7.5	....
Anterior abdominal wall	....	....	....	1	.....	1	.....	1	....	....	....	1	30	30	....
Antrum of highmore	1	....	....	1	.....	2	1	1	....	....	....	2	49	24.5	....
Axella, left	....	....	....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Back	....	....	....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Breast	....	....	....	.....	1	1	.....	1	....	....	....	1	27	27	....
Chest wall	1	....	....	.....	.....	1	.....	1	....	....	....	1	9	9	....
Face	....	....	....	1	.....	1	.....	1	....	....	....	1	7	7	....
Ischiorectal	....	....	....	3	5	8	2	5	1	....	....	8	174	21.7	....
Leg	....	....	....	1	.....	1	1	.....	.....	.....	.....	1	9	9	....
Lung	....	....	....	1	.....	1	.....	.....	.....	.....	1	1	16	16	....
Metastatic	....	....	....	1	.....	1	1	.....	.....	.....	.....	1	26	26	....
Pelvic	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	21	21	....
Perineal	....	....	....	1	.....	1	.....	.....	1	....	....	1	8	8	....
Peritonsillar	....	....	....	3	3	6	4	2	....	....	....	6	41	6.5	....
Periurethral	....	....	....	4	.....	4	2	2	....	....	....	4	86	21.5	....
Retropharyngeal	....	....	....	.....	2	2	1	1	....	....	....	2	76	38	....
Scrotal	....	....	....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2
Thigh	....	....	....	1	.....	1	.....	1	....	....	....	1	56	56	....
Valvo-vaginal	....	....	....	.....	3	3	1	1	....	....	....	2	26	13	1
Infections:															
Arm	....	....	....	.....	1	1	.....	1	....	....	....	1	138	138	....
Breast	....	....	....	1	3	4	2	.....	....	....	1	3	117	39	1
Finger	....	....	....	3	5	8	2	6	....	....	....	8	146	18.2	....
Foot	....	....	....	1	.....	1	.....	1	....	....	....	1	11	11	....
Frontal sinus	....	....	....	.....	2	2	1	.....	1	....	....	2	21	10.5	....
Hand	....	....	....	3	1	4	.....	3	....	....	....	3	21	7	1
Knee	....	....	....	1	.....	1	1	.....	....	....	....	1	72	72	....
Leg	1	....	....	.....	.....	1	.....	1	....	....	....	1	56	56	....
Nose and throat	....	....	....	.....	1	1	.....	1	....	....	....	1	24	24	....
Wrist	....	....	....	1	.....	1	.....	1	....	....	....	1	56	56	....
Ulcers:															
Finger	....	....	....	.....	1	1	.....	.....	1	....	....	1	10	10	....
Foot	....	....	....	.....	1	1	.....	1	....	....	....	1	30	30	....
Labia minor	....	....	....	.....	1	1	.....	1	....	....	....	1	28	28	....
Leg	....	....	....	.....	4	4	.....	4	....	....	....	4	109	27.2	....
Rectum	....	....	....	2	.....	2	1	1	....	....	....	2	27	13.5	....
Thigh	....	....	....	1	1	2	.....	1	1	....	....	2	12	6	....
Varicose	1	....	1	.....	4	6	.....	5	....	....	....	5	194	38.8	1
Bones and oints.															
Ankylosis:															
Elbow	....	....	....	.....	4	4	.....	3	....	....	....	3	133	44	1
Arthritis:															
Gonorrheal	2	....	....	8	6	16	.....	13	1	....	....	14	460	32.8	2
Infectious	3	....	....	7	8	18	2	12	2	....	....	16	354	22.2	2
Rheumatic	....	....	....	13	6	19	1	14	2	....	....	17	462	27.1	2
Specific	....	....	....	1	5	6	.....	5	1	....	....	6	233	38.5	....
Traumatic	....	....	....	1	.....	1	.....	1	....	....	....	1	23	23	....
Deformities:															
Cleft palate	....	....	....	.....	1	1	.....	.....	1	....	....	1	29	29	....
Pes planus	....	....	....	1	.....	1	.....	1	....	....	....	1	33	33	....
Syndactylism	....	....	....	.....	1	1	.....	1	....	....	....	1	51	51	....
Dislocations:															
Elbow	....	....	....	.....	2	2	.....	2	....	....	....	2	38	19	....
Hip	....	....	....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1

Medical and surgical diseases, except pay patients—Continued.

Diseases.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Bones and joints—Con.															
Dislocations—Con.															
Jaw					1	1	1					1	1		
Knee	1				2	3	1	1				2	93	46.5	1
Shoulder				1	2	3	2	1				3	54	18	
Vertebrae					1	1					1	1	55	55	
Exostosis, ilium					1	1			1			1	12	12	
Fractures:															
Clavicle				2	1	3	1	1	1			3	29	9.6	
Femur	2			7	4	13	3	6	1			10	793	79.3	3
Fibula	1				1	2		1	1			2	44	22	
Humerus				2	1	3	1	2				3	86	28.6	
Mandible				3		3		2	1			3	31	10.3	
Nasal bone				1		1		1				1	10	10	
Oscalcis	1					1		1				1	29	29	
Pelvis					1	1					1	1	1	1	
Radius				5	1	6		4				4	29	7.2	2
Rib		1		3		4		3			1	4	13	3.2	
Skull				2	1	3		1			1	2	14	7	1
Tibia				7	2	9	2	3	1		3	9	217	24.1	
Vertebra		1				1		1				1	49	49	
Osteomyelitis:															
Femur				1	4	5	1	1	2			4	243	60.7	1
Oscalcis	1			1		2	1	1				2	258	129	
Tibia	5			4	1	10	1	9				10	693	69.3	
Toe				1		1		1				1	3	3	
Periostitis	1			1	1	3	2					2	96	48	1
Sprain:															
Ankle				1	1	2	1	1				2	18	9	
Tuberculosis:															
Elbow	2					2		2				2	257	128.5	
Finger				3		3		2	1			3	104	34.6	
Hip				5	3	8		7	1			8	424	60.5	
Humerus				1		1		1				1	47	47	
Knee	2			1	1	4		2			1	3	352	117.3	1
Oscalcis				1		1		1				1	21	21	
Shoulder				1		1		1				1	108	108	
Spine	1			7	1	9		8				8	827	103.3	1
Tibia					1	1		1				1	3	3	
Circulatory system.															
Acute dilatation, heart				3	1	4					4	4	20	5	
Aneurysm:															
Aorta, abdominal				2		2		1	1			2	61	30.5	
Femoral				3		3	1		1			2	45	22.5	1
Popliteal				1		1					1	1	7	7	
Angina pectoris				1		1	1					1	1	1	
Arteriosclerosis	1			4		5		3			1	4	204	51	1
Cardiac decompensation				2	2	4		1			3	4	78	19.5	
Cerebral hemorrhage				3	6	9		2			6	8	120	15	1
Endocarditis	1			1	1	3		1			2	3	143	47.6	
Gangrene:															
Finger					1	1	1					1	24	24	
Foot	1			4		5	3	1			1	5	293	58.6	
Toe				1		1		1				1	13	13	
Hemorrhoids	3			20	9	32	17	8	6			31	462	14.9	
Hypertension				3	5	8		6				6	92	15.3	2
Myocarditis	1			5	6	12		7			5	12	465	38.7	
Pericarditis				2		2					2	2	65	32.5	
Valvular diseases:															
Regurgitation—															
Aortic	1			9	6	16		12	1		3	16	357	22.3	
Mitral	5			3		8		7			1	8	301	37.6	
Varicose veins				1	4	5		5				5	171	34.2	
Constitutional diseases.															
Addison's disease					1	1			1			1	8	8	
Anemia:															
Pernicious					1	1					1	1	5	5	
Secondary					1	1		1				1	41	41	
Diabetes, mellitus				3	3	6		2			4	1	95	662.5	

Medical and surgical diseases, except pay patients—Continued.

Diseases.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Constitutional diseases—Continued.															
Hodgkins					1	1		1				1	26	26	
Inanition	1			4	4	9		1			7	8	107	13.3	1
Malnutrition					5	5		3			2	5	271	54.2	
Marasmus				3		3					3	3	81	27	
Rachitis	2			2	2	6	1	2			1	4	543	135.7	2
Senility	1					1									1
Digestive system.															
Appendicitis:															1
Acute	3			17	13	33	15	8			9	32	548	17.1	
Chronic				8	32	40	28	7	1		2	38	861	22.5	2
Constipation	1			2	7	10	3	7				10	52	5.2	
Dysentery bacillary					1	1					1	1	7	7	
Enteritis	1			13	11	25	7	9			9	25	448	17.9	
Fecal fistula	1					1				1		1	12	12	
Fissure in ano				1	5	6	4	1	1			6	74	12.3	
Fistula in ano	3			11	6	20	10	5	4		1	20	450	22.5	
Hernia:															
Femoral				1		1	1					1	17	17	
Inguinal	5	1		46	4	56	41	6	4		3	54	1,008	18.6	2
Umbilical				2	2	4		3			1	4	65	16.2	
Ventral					3	3	1	1	1			3	35	11.6	
Intestinal obstruction				2	4	6	1	1			4	6	66	11	
Intestinal parasites					2	2	1	1				2	36	18	
Liver:															
Carcinoma				2		2					2	2	44	22	
Cholecystitis				1	1	2	2					2	40	20	
Cholelithiasis	1			2	4	7	2	3	1		1	7	220	31.3	
Cirrhosis				3	2	5		3	1			4	149	37.2	1
Icterus neonatorum				1		1					1	1	9	9	
Traumatic laceration				1		1	1					1	19	19	
Mouth:															
Carcinoma, tongue				1		1					1	1	102	102	
Glossitis, acute				1		1	1					1	8	8	
Odema of glottis				1		1		1				1	2	2	
Ranula	1					1		1				1	22	22	
Ulcerative stomatitis				1	1	2	1	1				2	69	34.5	
Vincent's angina				1		1	1					1	13	13	
Oesophageal stricture				3		3	2	1				3	9	3	
Pancreas:															
Carcinoma				1	1	2			1		1	2	34	17	
Pancreatitis	1				1	2	1	1				2	64	32	
Peritonitis					1	1	1					1	23	23	
Rectum:															
Carcinoma				1	1	2		2				2	50	25	
Incontinence				1		1			1			1	7	7	
Proctitis				1		1			1			1	12	12	
Prolapse				1	2	3		3				3	21	7	
Stomach:															
Carcinoma	2			6	2	10		1	1		8	10	168	16.8	
Gastritis—															
Acute				8	5	13	3	10				13	137	10.5	
Chronic	1			2	3	6	1	3	2			6	58	9.6	
Gastric ulcer				3	2	5	1	4				2	125	25	
Pylonic stenosis				2		2		1			1	5	13	7.5	
Eye, ear, nose, and throat.															
Eye:															
Astigmatism					1	1									1
Cataract, senile	2			2	2	6	1	4			1	6	375	62.5	
Coloboma, congenital					1	1			1			1	6	6	
Conjunctivitis	1			1	2	4	1	2				3	93	31	1
Corneal ulcer				2	1	3	1	1				2	34	17	1
Cyst, conjunctival					1	1	1					1	27	27	
Glaucoma	1			2		3		3				3	432	144	
Iridocyclitis	2					2	1	1				2	149	74.5	

Medical and surgical diseases, except pay patients—Continued.

Diseases.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Eye, ear, nose, and throat—Continued.															
Eye—Continued.															
Iritis	1	....	1	3	3	8	.....	8	....	....	....	8	383	47.8	....
Keratoiritis	1	....	....	.....	1	2	.....	1	....	....	....	1	33	33	1
Myopia	....	....	....	.....	1	1	.....	1	....	....	....	1	17	17	....
Ophthalmia neonatorum	....	....	....	1	1	2	.....	2	....	....	....	2	78	39	....
Optic atrophy	....	....	....	1	.....	1	1	.....	....	....	....	1	159	159	....
Panophthalmitis	....	....	....	1	2	3	3	.....	....	....	....	3	76	25.3	....
Phthisis bulbi	....	....	....	1	.....	1	1	.....	....	....	....	1	16	16	....
Pterygium	....	....	....	1	.....	1	.....	1	....	....	....	1	4	4	....
Staphyloma	1	....	....	.....	.....	1	.....	1	....	....	....	1	54	54	....
Strabismus, internal	....	....	....	1	1	2	2	.....	....	....	....	2	55	27.5	....
Ear:															
Mastoiditis	....	....	....	2	4	6	1	4	....	....	....	5	98	13.6	1
Otitis media	....	....	....	1	3	4	1	1	2	....	....	4	22	5.5	....
Nose:															
Epistaxis	....	....	....	2	.....	2	2	.....	....	....	....	2	24	12	....
Frontal sinusitis	....	....	....	1	2	3	1	1	....	....	....	2	47	23.5	1
Rhinitis atrophic	....	....	....	.....	1	1	.....	1	....	....	....	1	21	21	....
Throat:															
Hypertrophied tonsils	8	....	....	67	80	155	109	34	11	....	....	154	1,049	6.8	1
Laryngitis	....	....	....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Pharyngitis	....	....	....	2	1	3	.....	3	....	....	....	3	29	9.6	....
Tonsilitis	....	....	....	6	4	10	5	5	....	....	....	10	141	14.1	....
Genito-urinary system.															
Acute urinary retention	....	....	....	3	.....	3	.....	3	....	....	....	3	78	26	....
Carcinoma, bladder	....	....	....	1	.....	1	.....	1	....	....	....	1	48	48	....
Carcinoma, penis	....	....	....	1	.....	1	.....	.....	1	....	....	1	9	9	....
Carcinoma, prostate	....	....	....	1	.....	1	.....	.....	1	....	....	1	31	31	....
Chancroid	1	....	....	36	.....	37	5	22	4	....	....	31	680	21.9	6
Cystitis	....	....	....	1	7	8	4	2	1	....	....	7	239	34.1	1
Dietl's crisis	....	....	....	1	.....	1	.....	1	....	....	....	1	22	22	....
Elongated prepuce	....	....	....	9	.....	9	7	.....	....	....	....	7	94	13.4	2
Enuresis	....	....	....	.....	1	1	.....	.....	1	....	....	1	17	17	....
Epididymitis	3	....	....	12	.....	15	1	14	....	....	....	15	292	19.4	....
Fistula, urethral	1	....	....	3	.....	4	.....	3	....	....	....	3	76	25.3	1
Hematuria, idiopathic	1	....	....	.....	1	2	1	1	....	....	....	2	81	40.5	....
Hydrocele	....	....	....	7	.....	7	3	3	....	....	....	6	131	21.8	1
Hypernephroma	....	....	....	.....	1	1	.....	.....	.....	.....	1	1	5	5	....
Hypertrophied prostate	....	....	....	10	.....	10	2	4	....	....	2	8	252	31.5	2
Kidney:															
Acute nephritis	....	....	....	2	2	4	.....	2	....	....	1	3	118	39.3	1
Chronic interstitial nephritis	4	....	....	26	25	55	1	22	2	....	23	48	2,350	49.3	7
Chronic parenchymatous nephritis	1	....	....	3	2	6	.....	2	....	....	3	5	110	22	1
Movable kidney	....	....	....	1	1	2	1	1	....	....	....	2	115	57.5	....
Renal calculus	....	....	....	1	.....	1	.....	1	....	....	....	1	14	14	....
Tuberculosis	....	....	....	1	.....	1	.....	1	....	....	....	1	7	7	....
Lacerated urethra	....	....	....	.....	1	1	.....	1	....	....	....	1	14	14	....
Orchitis	....	....	....	2	.....	2	.....	2	....	....	....	2	4	2	....
Paraphimosis	....	....	....	3	.....	3	1	2	....	....	....	3	40	13.3	....
Phimosis	4	....	....	27	.....	31	18	12	1	....	....	31	615	19.8	....
Pruritus, vulvae	....	....	....	.....	1	1	.....	1	....	....	....	1	19	19	....
Pyelitis	....	....	....	.....	1	1	.....	1	....	....	....	1	22	22	....
Pyonephrosis	....	....	....	.....	1	1	1	.....	....	....	....	1	90	90	....
Stricture, urethral	1	....	....	12	.....	13	2	9	1	....	....	12	126	10.5	1
Supra pubic fistula	....	....	....	1	.....	1	.....	.....	.....	.....	1	1	98	98	....
Undescended testicle	....	....	....	1	.....	1	.....	1	....	....	....	1	10	10	....
Urethritis:															
Gonorrheal	1	1	....	10	9	21	4	12	1	....	....	17	149	8.7	4
Traumatic	....	....	....	1	.....	1	1	.....	.....	.....	.....	1	61	61	....
Uraemia	1	....	....	2	3	6	.....	.....	.....	.....	6	6	33	5.5	....
Vaginitis, gonorrheal	....	....	....	.....	1	1	.....	1	....	....	....	1	7	7	....
Varicocele	....	....	....	2	.....	2	1	1	....	....	....	2	33	16.5	....
Vesical calculus	1	....	....	.....	.....	1	.....	1	....	....	....	1	34	34	....

Medical and surgical diseases, except pay patients—Continued.

Disease.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Gynecological.															
Abortion:															
Complete	....	....	....	.....	15	15	7	5	1	...	1	14	128	9.1	1
Incomplete	....	....	....	.....	15	15	12	1	1	...	....	14	210	15	1
Threatened	....	....	....	.....	9	9	5	4	....	....	....	9	171	19	....
Carcinoma cervix	....	....	....	.....	14	14	1	5	7	...	1	14	442	31.5	....
Ectopic gestation	....	....	....	.....	6	6	6	.....	.....	.....	.....	6	138	23	....
Endocervicitis	....	....	....	.....	6	6	2	3	....	...	1	6	36	6	....
Endometritis	....	....	....	.....	14	14	6	7	1	...	....	14	203	14.5	....
Fibroma uteri	5	....	....	.....	73	78	48	16	5	...	2	71	1,629	22.8	7
Lacerated perineum	1	....	....	.....	10	11	8	2	....	....	....	10	282	14	1
Menstrual disorders:															
Dysmenorrhea	....	....	....	.....	1	1	.....	.....	1	...	....	1	1	1	....
Menorrhagia	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	11	11	....
Metrorrhagia	....	....	....	.....	4	4	1	3	....	....	....	4	44	11	....
Ovary:															
Cystic ovary	4	....	....	.....	27	31	16	11	3	...	....	30	369	12.3	1
Dermoid cyst	....	....	....	.....	1	1	.....	.....	.....	.....	1	1	5	5	....
Ovarian cyst	....	....	....	.....	1	1	1	.....	.....	.....	....	1	24	24	....
Peritonitis	....	....	....	.....	2	2	1	.....	.....	.....	1	2	66	33	....
Post operative adhesions	1	....	....	.....	8	9	2	5	....	...	2	9	155	17.2	....
Procidentia	....	....	....	.....	1	1	.....	.....	1	.....	.....	1	6	6	....
Pyosalpingitis	3	....	1	.....	38	42	26	4	5	...	5	40	941	23.4	2
Salpingitis	10	....	....	.....	101	111	51	40	12	...	2	105	2,065	19.6	6
Stenosis cervical	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	11	11	....
Uterine displacements:															
Anteflexion	....	....	....	.....	1	1	.....	1	....	....	....	1	14	14	....
Anteversion	....	....	....	.....	1	1	.....	1	....	....	....	1	33	33	....
Retroflexion	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	23	23	....
Retroversion	....	....	....	.....	3	3	1	2	....	....	....	3	44	14.6	....
Urethro vaginal fistula	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	19	19	....
Vesicovaginal fistula	1	....	....	.....	1	2	1	.....	1	.....	....	2	55	27.5	....
Undiagnosed	....	....	....	.....	1	1	.....	.....	....	1	....	1	1	1	....
Infectious diseases.															
Actinomycosis	....	....	....	1	.....	1	.....	.....	1	...	....	1	8	8	....
Anterio poliomyelitis	1	....	....	.....	.....	1	.....	1	....	.....	.....	1	214	214	....
Influenza	....	1	1	73	88	163	90	57	4	...	12	163	2,130	13.6	....
Malaria	....	....	....	1	1	2	1	1	....	....	....	2	40	20	....
Meningitis	....	....	....	1	.....	1	.....	.....	.....	.....	1	1	16	16	....
Pellagra	....	....	....	.....	2	2	.....	.....	.....	.....	2	2	49	24.5	....
Pertussis	....	....	....	2	5	7	.....	5	.....	.....	2	7	648	92.5	....
Pneumonia:															
Broncho	....	....	....	21	19	40	7	8	.....	...	24	39	612	15.6	....
Lobar	1	....	....	19	41	61	16	7	1	...	37	61	642	10.5	....
Rheumatic fever	1	....	....	6	9	16	1	11	.....	...	1	13	230	17.6	....
Septicemia	....	....	....	1	.....	1	.....	.....	.....	.....	1	1	4	4	....
Syphilis:															
Cerebrospinal	....	....	....	4	3	7	.....	2	2	...	3	7	160	22.6	....
Congenital	1	....	....	3	1	5	.....	3	.....	.....	2	5	165	33	....
Primary	....	....	....	8	2	10	.....	7	3	...	....	10	245	24.5	....
Secondary	....	....	....	7	14	21	.....	18	3	.....	.....	21	306	14.2	....
Tertiary	2	....	....	17	27	46	1	37	3	...	1	42	1,492	35.5	4
Tetanus	....	....	....	1	.....	1	.....	1	.....	.....	.....	1	2	2	....
Tuberculosis, pulmonary	3	....	1	13	10	27	.....	6	18	...	3	27	645	23.8	....
Typhoid fever	1	....	....	13	9	23	12	5	....	...	5	22	714	32.4	1
Injuries.															
Burn:															
Axilla	1	....	....	.....	.....	1	.....	1	....	....	....	1	291	291	....
Back	....	....	....	1	.....	1	.....	1	....	....	....	1	8	8	....
Body	....	....	....	2	2	4	.....	.....	.....	.....	3	3	136	45.3	1
Chest	....	....	....	2	.....	2	.....	2	....	....	....	2	135	67.5	....
Leg	....	....	....	.....	1	1	.....	1	....	....	....	1	13	13	....
Scalp	....	....	....	1	.....	1	.....	1	....	....	....	1	2	2	....
Contraction, cicatricial, of hand	....	....	....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Shock, traumatic	1	1	....	2	1	5	4	1	....	....	....	5	45	9	....

Medical and surgical diseases, except pay patients—Continued.

Diseases.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Injuries—Continued.															
Wounds:															
Abrasion—															
Hand				1		1		1				1	1	1	
Leg				1		1		1				1	19	19	
Contused—															
Abdomen				2		2		1	1			2	5	2.5	
Ankle				1		1			1			1	24	24	
Arm					1	1	1					1	4	4	
Back				1		1	1					1	7	7	
Body				2		2		2				2	7	3.5	
Eyelid				1	1	2		2				2	16	8	
Face				2	3	5		5				5	31	6.2	
Foot		1		2		3	1	2				3	27	9	
Groin				2		2	1	1				2	11	5.5	
Hip		1		1		2		2				2	11	5.5	
Knee	1			2	1	4		4				4	33	8.2	
Leg				1		1	1					1	8	8	
Neck					1	1	1					1	6	6	
Scalp				2		2	1	1				2	14	7	
Gunshot				11	5	16	2	10	2		1	15	161	10.7	1
Incised—															
Back				1		1	1					1	6	6	
Chest				1		1	1					1	2	2	
Forearm				1	1	2		2				2	13	6.5	
Tendo achilles				2		2	1	1				2	19	9.5	
Lacerated—															
Arm					1	1		1				1	25	25	
Face				3	3	6		5				5	23	4.6	1
Knee				2		2	1	1				2	37	18.5	
Leg				3	1	4		4				4	29	7.5	
Neck	1				1	1		1				1	3	3	
Scalp			1	6	4	11	2	9				11	60	5.4	
Toe				1		1		1				1	3	3	
Post operative					2	2		2				2	9	4.5	
Punctured—															
Back				3		3	2	1				3	20	6.6	
Body					1	1	1					1	14	14	
Groin				3	1	3	1	1			1	3	9	3	
Neck				1	1	2	1	1				2	16	8	
Sprain, ankle				2		2		2				2	30	15	
Strain:															
Back				2	1	3	2	1				3	18	6	
Hip				1	1	2		2				2	23	11.5	
Lymphatic system.															
Adenitis:															
Cervical	4			5	8	17	2	13	1			16	676	42.2	1
Inguinal				37	10	47	6	36	2			44	745	16.9	3
Submaxillary				1		1		1				1	5	5	
Lymphangitis	1			2		3		2	1			3	45	15	
Peritonitis, tubercular	2			4	5	11		6	1		4	11	540	49.9	
Nervous system.															
Cerebellor tumor				1		1					1	1	97	97	
Cerebral concussion				6	1	7		6				6	25	4.2	1
Chorea					2	2	1					1	25	25	1
Dementia				1	1	2			2			2	6	3	
Epilepsy	1			6	2	9	2	6	1			9	52	5.7	
Hemiplegia				4	2	6		3			1	4	563	140.7	2
Hysteria	1			2	4	7	2	4	1			7	51	7.2	
Locomotor ataxia					1	1									1
Neuralgia				7	2	9		9				9	79	8.7	
Neurasthenia	1		1	7	7	16	3	10	2			15	231	15.4	1
Neuritis					2	2					1	1	27	27	1
Syncope				2		2	1	1				2	5	2.5	
Tabes dorsalis					1	1		1				1	67	67	
Toxic psychosis					1	1			1			1	1	1	
Vertigo				1		1			1			1	1	1	

Medical and surgical diseases, except pay patients—Continued.

Diseases.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Obstetrical.															
Births:															
Living	....	....	....	119	143	262	248	.....	....	....	5	253	3,968	14.8	9
Remaining	10	....	....	.....	.....	10	10	.....	....	....	....	10	138	13.8	....
Babies with mother	1	....	....	5	8	14	.....	.....	....	14	....	14	169	12	....
Pregnancy:															
Delivered	19	....	....	.....	291	310	296	.....	....	....	2	298	6,575	22	12
Undelivered	....	....	....	.....	43	43	.....	.....	43	....	....	43	465	10.8	....
Puerperal sepsis	....	....	....	.....	2	2	.....	.....	....	....	2	2	24	12	....
Puerperium	1	....	....	.....	7	8	8	.....	....	....	....	8	102	12.7	....
Stillbirths	....	....	....	13	17	30	.....	.....	....	....	....	....	.....	.....	....
Poisoning.															
Alcoholism	....	1	....	18	1	20	6	12	2	....	....	20	116	5.8	....
Ammonia	....	....	....	.....	1	1	.....	1	....	....	....	1	1	1	....
Asphyxiation	....	....	....	.....	1	1	1	.....	....	....	....	1	3	3	....
Bay rum	1	....	....	.....	.....	1	1	.....	....	....	....	1	2	2	....
Heat exhaustion	....	....	....	.....	1	1	.....	1	....	....	....	1	5	5	....
Morphine	....	....	....	.....	1	1	.....	.....	1	....	....	1	1	1	....
Phenol	....	....	....	1	1	2	.....	2	....	....	....	2	7	3.3	....
Ptomain	....	....	....	.....	1	1	1	.....	....	....	....	1	1	1	....
Sunstroke	....	....	....	1	.....	1	.....	.....	....	....	1	1	1	1	....
Respiratory system.															
Abscess of lung	....	....	....	1	.....	1	.....	.....	....	....	1	1	1	1	....
Bronchial asthma	....	....	....	5	2	7	2	4	....	....	1	7	121	17.3	....
Bronchitis:															
Acute	1	....	....	12	14	27	16	10	....	....	1	27	245	90	....
Chronic	....	....	....	10	1	11	2	9	....	....	....	11	132	12	....
Coryza	....	....	....	1	.....	1	1	.....	....	....	....	1	3	3	....
Empyema	....	....	....	5	5	10	.....	4	....	....	5	9	296	32.8	1
Pharyngitis	....	....	....	.....	1	1	.....	1	....	....	....	1	4	4	....
Pleurisy:															
Fibrinous	....	....	....	1	6	7	3	4	....	....	....	7	184	26.2	....
Plastic	....	....	....	8	2	10	5	4	....	....	1	10	206	20.6	....
With effusion	1	....	....	2	5	8	2	4	1	....	1	8	337	42.1	....
Pulmonary edema	....	....	....	2	.....	2	.....	.....	....	....	2	2	2	1	....
Pulmonary hemorrhage	....	....	....	.....	1	1	.....	.....	....	....	1	1	4	4	....
Skin.															
Eczema	....	1	....	5	.....	6	.....	3	....	....	....	3	43	14.3	3
Impetigo	....	....	....	1	.....	1	.....	1	....	....	....	1	22	22	....
Intertrigo	....	....	....	1	.....	1	.....	1	....	....	....	1	8	8	....
Rhus toxicodendron	....	....	....	1	1	2	.....	2	....	....	....	2	17	8.5	....
Tinea tonsurans	1	....	....	.....	.....	1	.....	1	....	....	....	1	73	73	....
Tumors.															
Carcinoma, breast	....	....	....	.....	9	9	3	2	1	....	2	8	366	45.7	1
Fibro adenoma, breast	....	....	....	.....	1	1	1	.....	....	....	....	1	22	22	....
Fibroma molluscum	....	....	....	.....	1	1	.....	.....	....	....	....	.....	.....	.....	1
Fibro sarcoma, thigh	....	....	....	.....	1	1	1	.....	....	....	....	1	22	22	....
Ganglion of foot	....	....	....	.....	1	1	.....	1	....	....	....	1	31	31	....
Goiter:															
Cystic	1	....	....	.....	4	5	3	2	....	....	....	5	152	30.4	....
Exophthalmic	....	....	....	.....	3	3	2	.....	....	....	....	2	53	26.5	1
Keloid shoulder	....	....	....	.....	1	1	.....	.....	1	....	....	1	11	11	....
Lipoma:															
Back	....	....	....	.....	1	1	.....	1	....	....	....	1	13	13	....
Buttock	....	....	....	1	.....	1	.....	1	....	....	....	1	17	17	....
Hip	....	....	....	.....	1	1	1	.....	....	....	....	1	13	13	....
Shoulder	....	....	....	1	.....	1	1	.....	....	....	....	1	3	3	....
Vulva	....	....	....	.....	1	1	1	.....	....	....	....	1	29	29	....
Sebaceous cyst, neck	....	....	....	.....	1	1	.....	1	....	....	....	1	13	13	....
Tumor pituitary gland	....	....	....	.....	1	1	.....	1	....	....	....	1	38	38	....
Total	180	15	5	1,182	1,691	3,073	1,360	1,046	216	16	286	2,924	.....	.....	149

Medical and surgical diseases, pay patients.

Disease.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Abdominal fecal fistula	....	....	....	.....	1	1	.....	.....	.....	....	1	1	65	65	....
Abortion	....	....	1	.....	1	2	2	.....	.....	....	....	2	20	10	....
Abscess:															
Alveolar	....	....	....	.....	1	1	1	.....	.....	....	....	1	7	7	....
Axillary	....	....	....	.....	1	1	.....	1	.....	....	....	1	6	6	....
Back	....	....	....	1	.....	1	.....	1	.....	....	....	1	35	35	....
Cervical	....	....	....	.....	1	1	.....	1	.....	....	....	1	5	5	....
Foot	....	....	....	1	.....	1	.....	1	.....	....	....	1	4	4	....
Peritonsillar	....	....	....	1	1	2	1	.....	.....	1	....	2	12	6	....
Adenitis:															
Cervical	1	....	....	2	2	5	.....	4	1	.....	.....	5	65	13	....
Inguinal	....	....	....	1	2	3	.....	2	.....	....	....	2	32	16	1
Alcoholism	....	....	....	6	1	7	.....	5	1	.....	.....	6	12	2	1
Anemia	....	....	....	2	1	3	.....	3	.....	....	....	3	47	15.6	....
Aneurysm	....	....	....	1	2	3	.....	2	1	.....	.....	3	43	14.3	....
Appendicitis	1	1	....	12	16	30	22	6	.....	....	1	29	387	13.3	1
Arthritis infectious	....	....	....	3	2	5	.....	3	1	....	1	5	76	15.2	....
Births	1	....	....	32	43	76	71	.....	.....	....	5	76	827	10.8	....
Babies with mother	1	....	....	1	1	3	.....	.....	.....	3	....	3	49	16.3	....
Bronchitis	....	....	....	4	4	8	6	1	.....	....	1	8	61	7.6	....
Bronchial asthma	....	....	....	3	1	4	.....	3	.....	....	1	4	24	6	....
Carcinoma:															
Breast	1	....	....	1	5	7	2	3	2	.....	.....	7	116	16.5	....
Cervix	....	....	....	.....	3	3	.....	1	2	.....	.....	3	50	16.6	....
Esophagus	....	....	....	1	.....	1	.....	.....	.....	.....	1	1	6	6	....
Stomach	2	....	....	.....	.....	2	.....	.....	1	....	1	2	66	33	....
Cerebral concussion	....	....	....	1	1	2	1	1	.....	.....	.....	2	19	9.5	....
Cerebral hemorrhage	....	....	....	1	1	2	.....	2	.....	.....	.....	2	44	22	....
Chancroid	....	....	....	2	.....	2	.....	2	.....	.....	.....	2	6	3	....
Cholecystitis	....	....	....	2	3	5	2	3	.....	.....	.....	5	93	18.6	....
Cholelithiasis	....	....	....	.....	1	1	.....	1	.....	.....	.....	1	35	35	....
Cirrhosis liver	....	....	....	1	.....	1	.....	.....	.....	....	1	1	9	9	....
Coccygodynia	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	14	14	....
Constipation	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	5	5	....
Cyst:															
Submaxillary	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	15	15	....
Thyro-glossal	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	18	18	....
Cystic ovary	1	....	....	.....	26	27	15	4	1	....	2	22	444	21.8	5
Diabetes	....	....	....	1	2	3	.....	2	1	.....	.....	3	59	19.6	....
Dislocation, cartilage	....	....	....	1	1	2	.....	2	.....	.....	.....	2	48	24	....
Coccyx	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	36	36	....
Shoulder	....	....	....	1	.....	1	.....	1	.....	.....	.....	1	36	36	....
Duodenal ulcer	....	....	....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Eclampsia, post partum	....	....	....	.....	1	1	1	.....	.....	.....	.....	1	13	13	....
Ectopic gestation	....	....	....	.....	3	3	2	.....	.....	.....	1	3	39	13	....
Elongated cervix	....	....	....	.....	1	1	.....	1	.....	.....	.....	1	14	14	....
Empyema	....	....	....	1	.....	1	.....	1	.....	.....	.....	1	14	14	....
Endometritis	....	....	....	.....	8	8	4	3	1	.....	.....	8	73	9.1	....
Epistaxis	....	....	....	1	.....	1	1	.....	.....	.....	.....	1	7	7	....
Fibroma middle toe	....	....	....	1	.....	1	1	.....	.....	.....	.....	1	10	10	....
Fibroma literi	6	....	....	.....	66	72	51	13	2	....	2	68	1,320	19.4	4
Fistula in ano	1	....	....	.....	3	4	4	.....	.....	.....	.....	4	71	17.7	....
Fistula vesical	....	....	....	1	.....	1	.....	1	.....	.....	.....	1	49	49	....
Fracture:															
Costal cartilage	....	....	....	1	.....	1	.....	1	.....	.....	.....	1	11	11	....
Femur	1	....	....	1	4	6	1	5	.....	.....	.....	6	194	32.5	....
Mandible	....	....	....	.....	1	1	.....	1	.....	.....	.....	1	12	12	....
Radius	....	....	....	1	.....	1	1	.....	.....	.....	.....	1	1	1	....
Rib	....	....	....	2	.....	2	.....	2	.....	.....	.....	2	14	7	....
Skull	....	....	....	1	1	2	.....	.....	1	....	1	2	22	11	....
Gangrene, foot	....	....	....	1	1	2	2	.....	.....	.....	.....	2	32	16	....
Gastric ulcer	1	....	....	1	.....	2	1	1	.....	.....	.....	2	46	23	....
Gastritis	1	....	....	2	.....	3	1	1	.....	.....	.....	2	18	9	1
Gastro enteritis	....	....	....	.....	1	1	.....	.....	.....	.....	1	1	1	1	....
General debility	....	....	....	.....	1	1	.....	1	.....	.....	.....	1	2	1	....
Gonorrhea	....	....	....	2	1	3	.....	2	1	.....	.....	3	15	5	....
Goiter:															
Cystic	....	....	....	.....	6	6	2	3	.....	.....	.....	5	48	9.3	1
Exophthalmic	....	....	....	.....	3	3	2	.....	.....	.....	.....	2	28	14	1
Hair lip and cleft palate	....	....	1	.....	.....	1	.....	1	.....	.....	.....	1	20	20	....
Hemiplegia	....	....	....	3	2	5	.....	4	1	.....	.....	5	202	40.4	....
Hemorrhoids	1	....	....	8	4	13	8	3	1	.....	.....	12	185	15.4	1

Medical and surgical diseases, pay patients—Continued.

Diseases.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Hernia:															
Femoral	....	....	....	.....	1	1	1	.....	....	....	....	1	27	27	....
Incisional	....	....	....	2	1	3	1	.....	....	....	1	2	26	13	1
Inguinal	1	....	....	19	2	22	13	7	1	....	....	21	269	12.8	1
Umbilical	....	....	....	.....	1	1	.....	.....	....	....	1	1	9	9	....
Hydrocele	....	....	....	3	.....	3	.....	2	....	....	1	3	41	13.6	....
Hypertension	....	....	....	2	1	3	.....	3	....	....	....	3	67	22.3	....
Hypertrophied prostate	....	....	....	4	.....	4	.....	.....	....	....	3	3	120	40	1
Hypertrophied	2	....	....	40	73	115	84	27	4	....	....	115	433	3.7	....
Hypertrophied turbinate	....	....	....	1	.....	1	.....	1	....	....	....	1	20	20	....
Hysteria	....	....	....	.....	1	1	.....	1	....	....	....	1	14	14	....
Inanition	....	....	....	1	.....	1	.....	1	....	....	....	1	19	19	....
Infection, hand	....	....	....	.....	1	1	.....	1	....	....	....	1	8	8	....
Influenza	....	....	2	6	19	27	13	9	1	....	4	27	226	8.4	....
Intestinal obstruction	....	....	....	2	2	4	1	1	....	....	2	4	31	7.7	....
Ishio-rectal abscess	....	....	....	2	2	4	.....	4	....	....	....	4	51	12.7	....
Lacerated perineum	2	....	....	.....	.....	2	2	.....	....	....	....	2	59	29.5	....
Lacerated scalp	....	....	....	1	.....	1	.....	1	....	....	....	1	2	2	....
Lethargic encephalitis	....	....	....	.....	1	1	.....	.....	....	....	1	1	6	6	....
Lipoma	....	....	....	1	1	2	2	.....	....	....	....	2	21	10.5	....
Lues	....	....	....	6	3	9	.....	5	1	....	2	8	123	15.3	1
Mastitis	....	....	....	.....	2	2	1	1	....	....	....	2	16	8	....
Menstrual disturbances:															
Dysmenorrhea	....	....	....	.....	1	1	.....	1	....	....	....	1	14	14	....
Menorrhagia	....	....	....	.....	2	2	1	.....	1	....	....	2	10	5	....
Stenosis cervix	....	....	....	.....	2	2	2	.....	....	....	....	2	16	8	....
Mitral insufficiency	....	....	....	.....	1	1	.....	.....	....	....	1	1	23	23	....
Morphine poisoning	....	....	....	.....	1	1	.....	1	....	....	....	1	12	12	....
Myocarditis	....	....	....	1	1	2	1	.....	....	....	....	1	1	1	1
Nephritis	3	....	....	4	13	20	.....	6	1	....	9	16	281	17.5	4
Neurasthenia	....	....	....	3	2	5	.....	4	....	....	....	4	67	16.7	1
Neuritis	....	....	....	2	.....	2	.....	2	....	....	....	2	23	11.5	....
Osteomyelitis	2	....	....	4	2	8	.....	5	....	....	....	5	80	16	3
Otitis media	....	....	....	2	1	3	.....	2	1	....	....	3	42	14	....
Panophthalmitis	....	....	....	3	1	4	2	2	....	....	....	4	30	7.5	....
Pellagra	....	....	....	1	.....	1	.....	.....	....	....	1	1	13	13	....
Periostitis	....	....	....	.....	2	2	.....	2	....	....	....	2	27	13.5	....
Peritonitis, tubercular	....	....	....	1	4	5	.....	4	1	....	....	5	112	22.4	....
Pharyngitis	....	....	....	.....	1	1	.....	1	....	....	....	1	3	3	....
Phimosis	....	....	....	3	.....	3	2	1	....	....	....	3	34	11.3	....
Phthisis Bulbi	....	....	....	.....	1	1	1	.....	....	....	....	1	7	7	....
Pigmented mole	....	....	1	.....	.....	1	.....	1	....	....	....	1	3	3	....
Pleurisy	....	....	....	2	3	5	2	2	....	....	....	4	71	17.7	1
Pneumonia	....	....	....	13	14	27	8	5	....	....	13	26	207	7.9	1
Post influenzal psychosis	....	....	....	.....	1	1	.....	1	....	....	....	1	14	14	....
Post operation, adhesions	....	....	....	1	1	4	.....	2	1	....	1	4	50	12.5	....
Prematurity	....	....	....	1	.....	1	.....	.....	....	....	1	1	9	9	....
Proctitis	....	....	....	.....	1	1	.....	1	....	....	....	1	13	13	....
Pregnancy	2	....	....	.....	94	96	74	9	8	....	....	91	1,356	14.9	5
Puerperal sepsis	....	....	....	.....	1	1	.....	1	....	....	....	1	7	7	....
Puerperium	....	....	....	.....	1	1	1	.....	....	....	....	1	18	18	....
Rectal ulcer	....	....	....	.....	1	1	1	.....	....	....	....	1	10	10	....
Redundant abdominal wall	....	....	....	.....	1	1	1	.....	....	....	....	1	25	25	....
Renal calculi	....	....	....	1	.....	1	.....	1	....	....	....	1	21	21	....
Salpingitis	3	....	1	.....	27	31	14	9	1	....	2	26	567	21.8	5
Spondylitis deformans	....	....	....	1	.....	1	.....	1	....	....	....	1	7	7	....
Stricture of rectum	....	....	....	3	.....	3	1	2	....	....	....	3	34	11.3	....
Stricture of urethra	....	....	....	3	1	4	.....	4	....	....	....	4	63	15.7	....
Submucous polypus	....	....	....	.....	1	1	.....	1	....	....	....	1	14	14	....
Tabes dorsalis	....	....	....	2	1	3	.....	3	....	....	....	3	150	50	....
Toxemia of pregnancy	....	....	....	.....	2	2	1	1	....	....	....	2	16	8	....
Tubercular knee	1	....	....	1	.....	2	.....	1	1	....	....	2	25	12.5	....
Typhoid fever	....	....	....	3	4	7	6	.....	....	....	1	7	231	33	....
Uterine displacement	....	....	....	.....	5	5	1	3	1	....	....	5	60	12	....
Varicocele	1	....	....	1	.....	2	2	.....	....	....	....	2	15	7.5	....
Varicose ulcer	....	....	....	2	5	7	1	6	....	....	....	7	156	22.2	....

Medical and surgical diseases, pay patients—Continued.

Diseases.	Remaining July 1, 1918.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1919.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
Vesical calculus				1		1	1					1	21	21	
Vulvo vaginal abscess					2	2	1					1	11	11	1
Wounds:															
Burns, face					1	1				1		1	9	9	
Contused—															
Penis				1		1		1				1	6	6	
Renal region				1		1	1					1	6	6	
Scalp					1	1	1					1	6	6	
Gunshot—															
Chest				1		1		1				1	2	2	
Neck				1		1	1					1	27	27	
Lacerated—															
Body					1	1		1				1	7	7	
Cheek				1		1	1					1	7	7	
Subtotal	38	1	6	291	524	860	456	251	42	4	64	817			43
Use operating room						36						36			
X-ray						63						63			
Grand total	38	1	6	291	524	959	456	251	42	4	64	916			43

Operations and results, all patients.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Adenectomy	Adenitis:									
	Axillary				1	1		1		
	Cervical			1	5	6		6		
	Inguinal			12	4	16	4	12		
Adenoidectomy	Adenoids			95	117	212	208	4		
Amputation:										
Arm	Macerated				1	1		1		
Breast	Hypertrophy				1	1	1			
Cervix	Elongated				2	2	1	1		
Finger	Gangrene		1		1	2	1	1		
	Infected				1	1		1		
	Syndactylism				1	1		1		
	Tuberculosis			1		1		1		
Toes	Fibroma			1		1		1		
	Fracture			1	1	2	1	1		
	Gangrene			1		1				1
	Infected callosities				1	1	1			
Leg	Aneurysm			1		1				1
	Fracture			2		2	1	1		
	Gangrene			4	1	5	2	2		1
	Infected			1		1	1			
	Osteomyelitis			1		1	1			
	Tuberculosis			1		1		1		
Arthrectomy	Tuberculosis (knee)				1	1		1		
Cauterization:										
Arms	Syphilides			1		1		0	1	
	Ulcer			1	1	2	2			
Face	Pigmented mole		1			1		1		
Celiotomy:										
Appendectomy	Appendicitis:									
	Acute			5	7	12	8	1	1	2
	Chronic			21	157	178	154	19	1	4
	Gangrenous			3	1	4	1	2		1
	Perforated			4	4	8	5			3
	Subacute			1	9	10	6	4		
	Suppurative			2	1	3	2			1
Cæsarian section	Contracted pelvis				1	1	1			
	Eclampsia				2	2		1		1
	Fibroma uteri				1	1	1			

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Celiotomy—Continued.										
Cholecystotomy	Cholelithiasis				1	1	1			
	Cholecystitis:									
	Acute			1		1	1			
	Chronic			1		1	1			
	Cholelithiasis				2	2	1	1		
	Carcinoma:									
Colostomy	Rectum			1		1		1		
Cystotomy	Bladder			1		1		1		
Enterostomy	Intussusception				1	1				1
	Intestinal obstruction			2	2	4		1		3
Enteropathy	Puncture of cecum			1		1				1
	Carcinoma of cecum			2		2			1	1
Exploratory	Intestinal obstruction				1	1		1		
	Peritonitis (diffuse)				1	1				1
	Carcinoma (rectum)				1	1		1		
	Peritonitis (tuberculosis)			1	3	4		4		
	Intestinal adhesions			1		1		1		
	Pregnancy (indefinite)				1	1		1		
Freeing of adhesions	Ovarian adhesions				2	2	1	1		
	Obstruction (intestinal)				1	1				1
Gastro enterostomy (posterior).	Carcinoma, stomach			1		1				1
	Duodenal ulcer			2		2		2		
	Post operative adhesions				1	1				1
	Pyloric stenosis			1		1				1
Hysterectomy (pan)	Carcinoma				1	1				1
Supra vaginal	Fibroid uterus				24	24	20	4		
	Fibroid uterus, intraligamentous				4	4	2	2		
	Myoma uteri				1	1	1			
	Placenta praevia				1	1	1			
	Pregnancy				2	2	2			
	Procidentia uteri				1	1		1		
	Retroverted uteri				1	1	1			
Hystero oophorectomy.	Fibroid uterus and ovarian cyst				6	6	4	2		
	Ovarian abscess				2	2	2			
Hystero salpingectomy.	Fibroid uterus				4	4	4			
	Fibroid uterus, hydro salpinx, and salpingitis.				9	9	9			
	Pyosalpinx				2	2	2			
Hystero salpingo oophorectomy.	Fibroma uteri				55	55	38	14	3	
	Fibroma uteri and cystic ovaries				8	8	8			
	Fibroma uteri and salpingitis				2	2	2			
	Fibroma uteri and hydrosalpinx and cystic ovary.				2	2	2			
	Fibroma uteri and pyosalpinx				7	7	6			1
	Metritic uterus and pyosalpinx				4	4		4		
	Metritic uterus, salpingitis, and cystic ovary.				2	2		2		
	Metritic uterus and tubo-ovarian abscess.				1	1	1			
	Pyosalpinx, cystic ovary				22	22	20	2		
	Salpingitis, cystic ovary				18	18	16	2		
	Fibroma uteri, pyosalpinx, and cystic ovaries.				22	22	19	3		
	do				9	9	9			
	Fibroma uteri and salpingitis				3	3	3			
	Metritic uterus				2	2	2			
Hystero bilateral salpingo oophorectomy.	Cystic ovary				1	1	1			
	Dermoid cyst				2	2	1			1
	Ectopic pregnancy				3	3	2			1
	Hydrosalpinx-pyosalpinx and cystic ovaries.				16	16	11	5		
	Procidentia uteri				1	1		1		
	Bilateral pyosalpinx				23	23	15	6		2
	Bilateral salpingitis				4	4	4			
	Bilateral salpingo-oophoritis				3	3	3			
	Infantile uterus				1	1	1			
	Tubo-ovarian abscess				10	10	8	1		1
	Tubo-ovarian abscess and fibroma uteri.				2	2	2			
Myomectomy	Fibroma abdominal wall				1	1	1			
Intestinal resection.	Intestinal obstruction (gangrenous).				1	1				1
	Injury				1	1		1		
Oophorectomy	Cystic ovary				17	17	14	2		1
	Dermoid cyst				1	1	1			
	Fibro cystic ovary				1	1	1			
	Necrotic ovary				1	1	1			

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Celiotomy—Continued.										
Plastic	Cystic ovary	....	....	....	7	7	5	2	....	....
Salpingectomy	Hydrosalpinx	....	....	....	2	2	2	....	....	....
	Pyosalpingitis	....	....	....	1	1	1	....	....	....
	Salpingitis	....	....	....	8	8	8	....	....	....
Salpingo-oophorectomy.	Cystic ovary (hemorrhagic and fibrous uterus).	....	....	....	1	1	1	....	....	....
	Cystic ovary	....	....	....	9	9	9	1	....	1
	Dermoid cyst	....	....	....	2	2	2	....	....	....
	Ectopic pregnancy (tubal)	....	....	....	3	3	3	....	....	....
	Hydrosalpinx with cystic ovary	....	....	....	2	2	2	....	....	....
	Pyosalpiny	....	....	....	....	....	....	1	1	....
	Pyosalpinx with cystic ovary	....	....	....	4	4	4	....	....	....
	Pyosalpinx with salpingitis	....	....	....	8	8	5	3	....	....
	Retroverted uterus	....	....	....	1	1	1	....	....	....
	Retroflexed uterus	....	....	....	1	1	1	....	....	....
	Salpingo-oophoritis with sclerotic ovary.	....	....	....	14	14	14	....	....	....
Salpingo oophorectomy.	Salpingitis with cystic ovary	....	....	....	25	25	21	3	....	1
	Tubo-ovarian abscess	....	....	....	7	7	3	3	....	1
	Tubal abortion	....	....	....	2	2	1	1	....	....
	Tubal pregnancy (ruptured)	....	....	....	2	2	2	....	....	....
	Varicosity of pampiniform plexus.	....	....	....	3	3	1	2	....	....
Shortening of round ligament.	Procidentia uteri	....	....	....	3	3	1	2	....	....
	Retroversion	....	....	....	2	2	2	....	....	....
Ventral suspension.	Retroverted uteri	....	....	....	2	2	2	....	....	....
	Retroflexion	....	....	....	3	3	....	3	....	....
Circumcision	Chanchroidal phimosis	....	....	28	....	28	10	18	....	....
	Congenital phimosis	....	....	4	....	4	4	....	....	....
	Phimosis	....	....	47	....	47	32	14	....	1
	Paraphimosis	....	....	3	....	3	1	2	....	....
	Elongated prepuce	....	....	15	....	15	9	6	....	....
Colporrhaphy:										
Anterior	Cystocele	....	....	....	3	3	1	2	....	....
Posterior	Lacerated perineum	....	....	....	1	1	1	....	....	....
Craniectomy	Fracture tempo parietal bones	....	....	1	....	1	....	....	....	1
	Cerebellar cyst	....	....	1	....	1	....	....	....	1
Curettement	Empyema of antrum highmore	....	....	....	1	1	1	....	....	....
	Endocervicitis	....	....	....	2	2	2	....	....	....
	Endocervicitis and endometritis	....	....	....	4	4	3	1	....	....
	Endometritis	....	....	....	25	25	20	5	....	....
	Hyperemesis grovidarum	....	....	....	1	1	1	....	....	....
	Infantile uterus	....	....	....	1	1	....	1	....	....
	Incomplete abortion	....	....	....	1	1	1	....	....	....
	Ischiorectal abscess	....	....	....	1	1	....	1	....	....
	Osteomyelitis	....	....	....	2	2	....	2	....	....
	Periostitis	....	....	1	1	2	1	1	....	....
	Retained secundines	....	....	....	16	16	13	3	....	....
	Stenosis of cervix	....	....	....	1	1	1	....	....	....
	Stenosis of cervix (T. B.)	....	....	....	1	1	....	1	....	....
	Ulcer of leg	....	....	....	3	3	....	3	....	....
	Ulcer of rib	....	....	1	....	1	....	1	....	....
	Ulcer (rectal)	....	....	1	....	1	1	....	....	....
Cauterization	Carcinoma. Cervix	....	....	....	1	1	....	1	....	....
	Breast	....	....	....	2	2	1	....	....	1
	Tongue	....	....	1	....	1	....	....	....	1
	Hypertrophy of labia	....	....	....	1	1	....	....	....	1
	Rectal ulcer	....	....	....	1	1	1	....	....	....
	Tuberculous syphilides	....	....	2	....	2	....	2	....	....
	Urethral caruncle	....	....	....	1	1	....	....	1	....
Decompression	Depressed fracture of skull	....	....	1	....	1	....	1	....	....
	Intracranial pressure	....	....	1	....	1	....	....	....	1
Dilation	Cyst of Wharton's duct	....	....	....	1	1	1	....	....	....
	Fissure in ano	....	....	....	3	3	3	....	....	....
	Stenosis of cervix	....	....	....	4	4	3	1	....	....
	Stricture of meatus	....	....	....	1	1	....	1	....	....
	Stricture of rectum	....	....	4	1	5	2	3	....	....
	Stricture of urethra	....	....	6	....	6	2	4	....	....
Enucleation	Fibroma uteri	....	....	....	1	1	1	....	....	....
	Hydrocele	....	....	1	....	1	1	....	....	....
	Lipoma of buttock	....	....	....	1	1	1	....	....	....
Eye	Panophthalmitis	....	....	3	3	6	1	5	....	....
	Phthisis bulbi	....	....	1	1	2	2	....	....	....
Epididymectomy	Tuberculous (epididymitis)	....	....	1	....	1	....	1	....	....

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Examination	Rectal stricture				1	1				1
Exploratory	Bullet in chest			1		1		1		
	Cystitis				2	2	2			
	Carcinoma of prostate			1		1				1
	Carcinoma of pancreas			1		1				1
	Fibroma uteri with pregnancy				1	1	1			
	Gumma of anterior nares				1	1		1		
	Hematoma of scalp			1	1	2	1			1
	Laceration of scalp				1	1	1			
	Neurasthenia			1	1	2		1	1	
	Post operative adhesions			1		1		1		
	Peritonsilar abscess			2		2	2			
	Sarcoma of kidney				1	1		1		
	Ulcer of bladder				1	1		1		
	Ulcer of rectum			1		1	1			
	Undetermined			1		1		1		
	Urethral obstruction			1		1		1		
Excision:	Coccyx (movable)				2	2	1	1		
	Fistula in ano			12	11	23	16	7		
Gland	Adenitis			1	1	2		2		
Sac	Abscess				5	5	4	1		
	Bartholinian cyst				2	2	2			
	Caruncle (urethral)				2	2	2			
	Cholazion			3	4	7	7			
	Chronic ulcer			2		2		2		
	Cyst				7	7	6	1		
	Fibroma				2	2	1	1		
	Urethral fistula			1		1		1		
	Recto-vaginal fistula				1	1				1
	Granulomata			1		1		1		
	Hydrocele			7		7	3	4		
	Intraligamentous cyst				2	2	2			
	Ganglion			1	1	2	2			
	Lipoma			2	5	7	4	3		
	Periostitis			2		2	2			
	Polypus				2	2	1	1		
	Recurrent carcinoma				1	1				1
	Thyroid cyst				7	7	6	1		
	Umbilical fistula				1	1				1
	Varicocele			3	1	4	2	2		
Extirpation	Adenitis				1	1		1		
	Conjunctival sac				1	1	1			
	Panophthalmitis			1		1	1			
	Staphyloma				1	1		1		
Extraction	Bullet in leg				1	1		1		
	Bullet in neck			1		1	1			
Eye	Cataract			4	2	6	4	2		
Teeth	Decayed				2	2	2			
Forceps delivery					2	2	2			
Freeing adhesions	Post operative adhesions			1	4	5	2	1		2
Hemorrhoidectomy	Hemorrhoids:									
	External			8	5	13	8	4		1
	Internal			6	5	11	8	3		
	Mixed			8	3	11	9	2		
Hernioplasty	Femoral hernia			1	1	2	2			
	Inguinal hernia:									
	Direct			32	6	38	30	6		2
	Indirect			28	5	33	26	6		1
	Umbilical hernia				2	2	1			1
	Ventral hernia			1	2	3	1	1	1	
Incision and drain:	Abdominal wall				2	2	2			
Abscess.	Alveolar			2	1	3	2	1		
	Appendiceal			2	2	4	3			1
	Antrum of highmore			1	1	2	1	1		
	Arm				1	1		1		
	Bartholinian				1	1		1		
	Breast				2	2		2		
	Carbuncle			2		2		2		
	Cervical				3	3	1	2		
	Finger				1	1	1			
	Hand				2	2	2			
	Ischiorectal			3	3	6	2	4		
	Illo lumbar				1	1		1		
	Knee			2		2	1		1	

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Incision and drain—Continued.	Peri:									
Abscess—Contd.	Rectal			2	3	5		5		
	Tonsillar				1	1	1			
	Urethral			5		5	1	4		
	Perineal			1		1		1		
	Peritonitis			1	2	3		1	1	1
	Pott's fracture			1		1	1			
	Retro pharyngeal				1	1	1			
	Synovitis			1		1		1		
	Subperitoneal			1		1	1			
	Scrotum			5		5	4	1		
	Tendon				2	2		2		
	Thigh			3		3	2	1		
Adenitis	Ascites				2	2				2
	Axillary				2	2	2			
	Cervical			3	4	7	5	1	1	
	Inguinal			4		4		3	1	
Cellulitis	Hand				2	2	1	1		
	Mastoid			2	1	3		2		1
	Osteomyelitis			1	1	2	1	1		
	Ovarian				1	1		1		
	Posterior colporrhophy				2	2		1		1
	Varicocele			1		1	1			
Insertion of bone peg	Ununited fracture of femur			1		1	1			
Iridectomy	Glaucoma			2		2		2		
Lateral incisions	Chanchroidal			1		1		1		
	Chanchroidal phimosis			14		14	5	9		
	Phimosis			4		4	1	3		
Lithotomy	Vesicle calculi			1		1		1		
Manipulation	Ankylosis				3	3		3		
	Arthritis				1	1		1		
	Dislocation			1	2	3	2	1		
Mastoidectomy	Mastoiditis			1	1	2	1	1		
Manipulation and cast	Knee			2	2	4	1	3		
	Elbow			1		1	1			
Needling	Cataract			1	1	2		2		
Nephrectomy	Hematuria				1	1	1			
	Hyponephroma				1	1				1
	Pyonephrosis				1	1	1			
Nephropexy	Floating kidney				1	1	1			
Orchiotomy	Hydrocele			1		1		1		
Orchidectomy	do			1		1				1
Osteotomy	Mastoiditis			1		1				19
	Genu valgus			1		1		1		
Perineal section	Stricture of urethra			2		2		2		
Perineorrhaphy, plastic.	Lacerated perineum				20	20	14	6		
	Cleft palate		1			1	1			
	Adhesions of arm				1	1	1			
	Cystic ovary				1	1	1			
	Deflected septum			1		1	1			
	Hare lip		1			1	1			
Plaster cast	Fracture			5	2	7	1	3	2	1
	Tuberculosis:									
	Hip			1	2	3		3		
	Knee			1		1		1		
	Sublaxation			2	1	3	3			
Podalic version					4	4	4			
Posterior colpotomy	Pelvic abscess				4	4	3			1
	Salpingitis				3	3	2	1		
Prostatectomy	Hypertrophied prostate			6		6	2	2		2
Supra pubic	Prostate			8		8	3			5
Radical amputation	Carcinoma, breast				9	9	5	4		
Reduction and fixation:										
Dislocation	Elbow joint			1	1	2		2		
	Shoulder joint			3		3	3			
	Knee joint				1	1		1		
Fracture	Femur			5	3	8	3	5		
	Humerus				1	1	1			
	Nasal				1	1	1			
	Radius			1	1	2	1	1		
	Radius and ulna			1		1		1		
	Tibia			4	1	5	1	3		1
	Tibia and fibula			1	1	2	1	1		
Removal:										
Bullet	Shoulder				1	1		1		
	Body			3		3	1	2		

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Removal—Continued.										
Cartilage	Semilunar cartilage	....	....	1	.....	1	.....	1	....	....
	Vertebra	....	....	1	.....	1	.....	1	....	....
Cyst	Ovarian	....	....	....	2	2	.....	1	....	1
	Thyroid	....	....	....	1	1	1	.....	....	....
	Foreign body	....	....	1	.....	1	1	.....	....	....
	Stitches in wound	....	....	....	1	1	.....	1	....	....
Tumor	Ganglion	....	....	....	1	1	.....	1	....	....
	Submucous fibroid	....	....	....	1	1	1	.....	....	....
	Ulcer	....	....	1	.....	1	1	.....	....	....
	Ptergium	....	....	1	.....	1	.....	1	....	....
	Lipoma	....	....	1	.....	1	1	.....	....	....
Repair	Adhesions	....	....	....	1	1	.....	1	....	....
	Aneurism	....	....	2	.....	2	1	1	....	....
	Internal strabismus	....	....	....	2	2	2	.....	....	....
	Post operative abdominal wound	....	....	....	1	1	.....	.....	....	1
	Severed tendons	....	....	2	1	3	2	1	....	....
	Lacerated scalp	....	....	....	1	1	.....	.....	1	....
	Traumatic rupture of liver	....	....	1	.....	1	1	.....	....	....
	Urethral fistula	....	....	....	1	1	1	.....	....	....
Resection	Cystic ovary	....	....	....	3	3	2	1	....	....
	Empyema	....	....	4	3	7	.....	6	....	1
	Intestinal obstruction	....	....	1	.....	1	.....	.....	....	1
	Periostitis of ribs	....	....	....	1	1	.....	1	....	....
	Post operation pressure on toe	....	....	1	.....	1	.....	1	....	....
Sequestrotomy	Frontal sinusitis femur	....	....	1	.....	1	2	.....	....	....
	Osteomyelitis	....	....	1	1	2	1	1	....	....
	Radius and ulna osteomyelitis	....	....	1	.....	1	.....	1	....	....
	Tibia osteomyelitis	....	....	1	.....	1	.....	1	....	....
Suturing	Lacerated:									
	Eyelid	....	....	....	2	2	2	.....	....	....
	Foot	....	....	3	1	4	4	.....	....	....
	Forearm	....	....	....	2	2	2	.....	....	....
Surgical dressings	Wounds	....	....	....	3	3	.....	2	....	1
Tenotomy	Internal strabismus	....	....	1	1	2	2	.....	....	....
	Severed tendo achilles	....	....	1	.....	1	.....	1	....	....
Thyroidectomy	Cystic goiter	....	....	....	10	10	5	5	....	....
	Exophthalmic goiter	....	....	....	5	5	3	2	....	....
Tonsillectomy	Hypertrophied faucial tonsils	....	....	61	150	211	200	10	1	....
Torsion	Submucous polypus	....	....	....	2	2	2	.....	....	....
Trachelorraphy	Lacerated cervix	....	....	....	3	8	7	1	....	....
Trephine	Glaucoma	....	....	3	.....	3	.....	3	....	....
	Fracture of skull	....	....	....	1	1	.....	1	....	....
	Empyema of frontal sinus	....	....	....	1	1	1	.....	....	....
Whiteheads	Internal hemorrhoids	....	....	2	.....	2	1	1	....	....
Wiring of bone fracture	Clavicle	....	....	1	.....	1	1	.....	....	....
	Mandible	....	....	....	1	1	.....	1	....	....
Total		....	4	644	1,293	1,940	1,374	463	20	83

Obstetrical record, except pay patients.

Month.	White.		Colored.		Total.	Eclampsia.	Cæsarian section.	Podalic version.	Lacerations.	Postpartum hemorrhage.	Stillbirths.	Twins.	Head.	Breech.	Face.	Forceps.	Primipara.	Multipara.
	Male.	Female.	Male.	Female.														
July	....	....	19	14	33	0	1	0	7	3	4	0	33	0	0	4	14	19
August	....	....	7	20	27	0	0	0	9	6	3	0	26	1	0	0	10	17
September	....	....	8	13	21	0	1	0	8	1	2	0	19	2	0	0	9	12
October	....	....	15	20	35	0	0	0	11	5	1	0	35	0	0	0	16	19
November	....	....	8	16	24	0	0	0	7	0	3	0	24	0	0	0	16	8
December	....	....	7	11	18	0	0	0	11	2	1	0	18	0	1	0	10	8
January	....	....	11	13	24	0	0	0	9	1	1	1	23	1	0	0	13	10
February	....	....	12	10	22	0	0	0	6	0	3	0	22	0	0	0	14	8
March	....	....	13	13	26	0	0	0	8	1	3	0	22	3	1	0	14	12
April	....	....	14	15	29	0	0	0	15	2	3	0	27	1	0	0	19	10
May	....	....	9	13	22	0	0	0	5	2	1	2	22	0	0	0	9	11
June	....	....	15	6	21	0	0	0	8	3	5	1	21	0	0	0	12	8
Total	....	....	138	164	302	0	2	0	104	26	30	4	292	8	2	4	156	142

Anesthetics, all patients.

	Admitted white.		Admitted colored.		Total.
	Male.	Female.	Male.	Female.	
General:					
Chloroform		1	3	4	8
Chloroform and ether			2	1	3
Chloroform and cocaine			1		1
Ether			558	1,240	1,798
Ether and olive oil				3	3
Nitrous oxide			7		7
Nitrous oxide and ether			2		2
Novocaine and ether			2		2
Local:					
Apothecene			4	2	6
Cocaine			50	35	85
Ethyl chloride			3	4	7
Novocaine			5	3	8
Total		1	637	1,292	1,930

Pathological and X-ray laboratories.

RADIOGRAPHS.

	1919	1918		1919	1918
Abdomens	54	51	Kidneys and ureters	29	21
Chests	116	136	Knees	32	48
Elbows	18	21	Shoulders	22	15
Feet and ankles	48	60	Spine	12	14
Femurs	54	12	Tibias	14	40
Forearms	32	34	Hands and wrists	78	69
Heads and teeth	82	51			
Hips and pelves	19	31			
Humeri	12	8	Total	622	611

X-RAY TREATMENTS.

Disease.	Cases.	Cured.	Improved.	Unimproved.	Unknown.	Treatments.
Inoperable carcinoma (breast)	1			1		6
Post-operated breast (carcinomatous)	2		2			6
Tuberculous adenitis	14	11	3			70
Keloids	8	4	2		2	48
Total	25	15	7	1	2	130

LABORATORY EXAMINATIONS.

	1919	1918		1919	1918
Red counts	74	69	Autopsies	12	14
White counts	330	284	Museum specimens	35	38
Hemoglobin estimate	60	33	Sputum examinations	104	93
Widal reactions	55	41	Urinalyses	1,422	1,384
Malarial examinations	1	6	Noguchi reactions	1,107	1,080

Total number positives, 325 or 29.3 per cent.
Total number negatives, 777 or 70.3 per cent.
Total number doubtful, 5 or 0.4 per cent.

Three hundred and four of these cases (about 29 per cent) came from the dispensary.

Numerous examinations of gastric contents, feces, bacteriological smears and cultures, differential counts, blood cultures, coagulation estimates, spinal fluids, "red tests" and blood cultures not recorded, were made and are not enumerated above.

Nativities, except pay patients.

Nativities.	White.		Colored.		Nativities.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Africa			1		Minnesota				1
Alabama			16	5	Mississippi			3	3
Arkansas			1	2	Missouri			3	1
British West Indies			9	2	Nebraska			3	
Canada				1	New Jersey			3	3
Central America			2		New York			7	7
Cuba			1		North Carolina			60	72
District of Columbia	5	2	483	627	Ohio			8	4
Delaware			1	1	Oklahoma			5	1
Dutch Guiana			1		Pennsylvania		1	12	12
Florida			10	6	Portugal	1			
Georgia			23	24	Porto Rico	2		2	
Germany	1				Rhode Island			1	
Honolulu				1	South Carolina			30	69
Illinois			4	1	Spain	1			
Indiana			4		Tennessee			5	3
Ireland	1				Texas			7	3
Italy	3				Virginia			281	488
Kansas			1		West Virginia			7	9
Kentucky			7	2	Wisconsin			1	
Louisiana			6	2	Unknown			7	7
Massachusetts	1	1		1					
Maryland			167	333	Total	16	4	1,182	1,691
Michigan	1								

Occupations, except pay patients.

Occupations.	White.		Colored.		Occupations.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Actress				1	Mail carrier			1	
Baker	1		2		Matron				1
Barber			5		Messenger			12	
Bellman			2		Merchant			1	
Blacksmith			2		Miner			6	
Butler			16		Minister			4	
Carpenter			10		Nurse				7
Charwoman				6	Orderly			3	
Chauffeur			42		Painter			4	
Clerk	1			7	Plasterer			4	
Cook			28	53	Porter			36	
Dentist				1	Printer			2	
Doctor				1	Shoemaker			1	
Domestic		1		1,167	Skilled laborer			2	
Dressmaker				10	Students			191	117
Driver	1		9		Tailor			3	
Electrician	2				Tanner			1	
Elevator operator				1	Teamster			2	
Engineer			2		Undertaker			3	
Expressman			1		Valet			1	
Farmer	1		45		Waiter			46	
Fireman			12		Watchman	1		3	
Government employee	1	2	14	4	Y. M. C. A. worker			2	
Hair dresser				3	Motorman	2			
Housewife	1			150	Soldier	5			
Janitor			5		Stenographer		1		
Laborer			519		None (births in hospital)			133	136
Laundress				8					
Mechanic			7		Total	16	4	1,182	1,691
Maid				18					

Nativities, pay patients, except births.

Nativities.	White.		Colored.		Nativities.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Alabama			1		Nebraska		1		
Arkansas			3	3	New Jersey			2	6
Central America			1		New York		2	1	4
District of Columbia		1	115	178	North Carolina			15	40
Florida				4	Ohio			3	2
Georgia			9	19	Pennsylvania		1	1	8
Illinois			1		South Carolina			11	26
Indiana			2	2	Tennessee			5	1
Kansas		1			Texas			4	5
Kentucky			2	4	Virginia	1		75	183
Louisiana			1	3	West Virginia			1	4
Maryland			39	73	Wisconsin			2	
Maine			1						
Mississippi			4	8	Total	1	6	302	573
Missouri			3						

Occupations, pay patients, except births.

Occupations.	White.		Colored.		Occupations	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Agent			1		Miner			1	
Barber	1		6		Minister			3	
Butler			1		Missionary			2	
Carpenter			2		Nurse				3
Chauffeur			4		Porter			7	
Clerk		1	5	9	Plumber			1	
Cook			7	10	Printer			1	
Dentist			1		Sailor			1	
Doctor			7		Soldier			2	
Domestic		1		356	Stenographer		1		1
Dressmaker				20	Student			63	69
Driller			1		Tailor			3	1
Driver			2		Teacher			7	19
Farmer			16		Telephone operator				1
Housekeeper				4	Typist		2		
Housewife				56	Undertaker			1	
Government employee			19	14	Valet			2	
Huckster			1		Vulcanizer			2	
Laborer			79		Waiter			11	
Laundress				4	Y. M. C. A. worker			1	
Lawyer			1		Y. M. C. A. secretary				1
Janitor			2		Skilled laborer			12	
Maid				5	Cashier		1		
Mechanic			1						
Merchant			2		Total	1	6	302	573
Messenger			24						

OUT-DOOR SERVICE.

The following tables show the number of medical and surgical diseases treated in the out-door or dispensary service:

Medical and surgical diseases—out-patient department.

Diagnosis.	White.		Colored.		
	Male.	Female.	Male.	Female.	Total.
Medical.					
Adenitis, cervical	....	....	1	2	3
Anemia, secondary	....	....	2	6	8
Aneurysm, aortic	....	....	1	....	1
Aortic insufficiency	....	....	8	1	9
Amenorrhea	....	....	....	6	6
Appendicitis, chronic	....	....	4	3	7
Arthritis:					
Infectious	....	....	4	2	6
Gonorrheal	....	....	2	....	2
Arteriosclerosis	1	2	18	7	28
Asthma, bronchial	....	....	2	9	11
Angina pectoris	....	....	2	....	2
Autointoxication	1	....	1	3	5
Bronchitis:					
Acute	2	....	56	29	87
Chronic	....	....	15	7	22
Cardiac hypertrophy	....	....	4	....	4
Chlorosis	....	....	....	2	2
Coccydynia	....	....	2	2	4
Constipation	....	....	3	4	7
Coryza, acute	....	....	15	22	37
Cystitis, acute	....	....	3	1	4
Debility:					
General	....	....	3	2	5
Senile	....	....	1	2	3
Dementia precox	....	....	2	....	2
Diabetes	....	....	....	3	3
Dysentery	1	....	1	2	4
Eczema	....	....	1	2	3
Empyema	....	....	4	1	5
Endocarditis	....	....	1	2	3
Enuresis	....	....	2	2	4
Enteritis	....	....	2	3	5
Enteroptosis	....	....	....	3	3
Epilepsy	....	....	1	....	1
Febricula	....	....	2	1	3
Gastritis:					
Acute	....	....	17	20	37
Chronic	....	....	3	5	8
Gastro-enteritis	....	1	2	7	10
Goiter, exophthalmic	....	....	....	2	2
Gout	....	....	1	....	1
Hemorrhoids	....	....	2	2	4
Hepatitis	....	....	2	3	5
Hypertension	....	....	3	1	4
Influenza	9	3	36	48	96
Insolation	....	....	....	1	1
Intestinal indigestion	....	....	2	2	4
Intestinal worms	....	....	....	2	2
Malaria	....	....	3	2	5
Mastitis	....	....	....	1	1
Migraine	....	....	1	2	3
Mitral insufficiency	....	....	12	7	19
Menopause	....	....	....	3	3
Mucus colitis	....	....	1	4	5
Myalgia	....	....	4	16	20
Myocarditis	2	....	11	3	16
Neuralgia:					
Facial	....	....	2	2	4
Intercostal	....	....	3	7	10
Nephritis:					
Acute	....	1	6	....	7
Chronic	....	....	20	11	31
Neurasthenia	....	1	1	4	6
Ozæna	....	....	2	....	2
Parotitis	....	....	3	....	3
Pleurisy	....	....	5	2	7
Pneumonia:					
Bronchial	....	....	8	11	19
Lobar	....	....	2	1	3
Pregnancy	....	....	....	6	6
Paralysis agitans	....	....	....	2	2
Rheumatism:					
Acute	....	....	18	3	21
Chronic	....	....	8	10	18
Gonorrheal	....	....	2	....	2
Muscular	....	....	2	5	7
Rubella	....	....	2	3	5
Sciatica	....	....	....	2	2
Syphilis	....	....	2	2	4
Tonsillitis	....	....	2	....	2
Tuberculosis, pulmonary	....	....	1	....	1
Turpentine poisoning	....	....	....	1	1
Varicella	....	....	1	2	3
Urticaria	....	....	....	2	2
Undiagnosed	1	....	22	20	43
Total	17	8	375	336	736
Revisits	....	....	....	....	1,620
Minor surgery.					
Abscess:					
Alveolar	....	....	1	3	4
Cervical	....	....	3	6	9
Peri-tonsillar	....	....	2	1	3
Adenitis:					
Axillary	....	....	1	3	4
Cervical	....	....	2	6	8
Inguinal	....	....	2	2	4
Cellulitis:					
Arm	....	1	2	6	9
Hand	2	3	17	36	58
Leg	....	....	2	5	7
Cyst, sebaceous	....	....	2	5	7
Dislocations:					
Elbow	....	1	1	2	4
Patella	....	....	1	....	1
Shoulder	1	....	3	1	5
Fractures:					
Colle's	....	....	3	2	5
Humerus	....	....	1	2	3
Mandible	1	....	....	1	2
Radius	....	....	....	1	1
Ulna	....	....	....	2	2
Foreign body:					
Ear	....	....	2	1	3
Eye	3	1	8	4	16
Foot	....	....	2	....	2
Hand	2	3	11	15	31
Rectum	....	....	....	2	2
Throat	....	....	6	9	15
Ganglion	....	....	2	3	5
Ingrowing toenail	....	....	2	4	6
Prepatellar bursa	....	....	....	1	1
Sprains:					
Ankle	1	....	12	3	16
Knee	1	1	....	2	4
Shoulder	....	....	3	1	4
Wrist	2	....	12	3	17
Vaccinations	2	5	144	295	446
Total	15	15	247	535	812
Surgical dressings	....	....	....	....	2,548

Medical and surgical diseases—out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
Neurology.					
Bell's palsy			1	2	3
Chorea				5	5
Embolism, cerebral			5	8	13
Epilepsy			4	7	11
Hystero-epilepsy				1	1
Hemorrhage, cerebral			3	1	4
Hysteria				4	4
Neurasthenia			3	11	14
Neuroses, occupational			1		1
Neuritis			2	5	7
Paraplegia, spastic			2		2
Syphilis:					
Cerebral			1		1
Spinal			4	1	5
Tabes dorsalis			3		3
Undiagnosed			8	4	12
Total			37	39	76
Revisits					204
Orthopedic.					
Ankylosis:					
Elbow			2	2	4
Hip			3	5	8
Arthritis:					
Gonorrheal			8	2	10
Hypertrophic				2	2
Infectious			5	4	9
Bursitis, subacromial			8	3	11
Contractures:					
Ankle			3	2	5
Knee			2	2	4
Wrist			7	1	8
Fractures:					
Humerus			1	1	2
Tibia			2	1	3
Dislocation, semilunar cartilage			2		2
Genu valgum			2	3	5
Genu varum			4	3	7
Osteomyelitis			5	4	9
Paralysis			3	2	5
Periostitis:					
Specific			5	3	8
Traumatic			3	1	4
Pesplanus			10	5	15
Sacro-iliac relaxation			5	3	7
Scoliosis			2	3	5
Sprains:					
Ankle			5	2	7
Wrist			8	2	10
Synovitis			1		1
Undiagnosed			10	8	18
Total			106	63	169
Revisits					307
Pediatrics.					
Acne vulgaris			5	11	16
Astigmatism			2	4	3
Adenoids			5	8	1
Adenitis, tuberculous			2	3	5
Autointoxication			2	3	5
Bronchitis:					
Acute			12	19	31
Chronic			5	11	16
Chorea				2	2
Colitis			1	1	2
Condylomata				1	1
Constipation			2	1	3
Contusions			2	1	3
Dermatitis			5	3	8
Diarrhea			21	36	57
Eczema			4	1	5

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
Pediatrics—Continued.					
Enteritis			6	4	10
Enterocolitis			5	9	14
Furunculosis			1		1
Hernia:					
Inguinal			1		1
Umbilical			2	2	4
Gastritis, acute			8	10	18
Ileo-colitis			4	5	9
Impetigo			3	2	5
Intestinal worms			5	7	12
Laryngitis, acute			2	1	3
Lues, congenital			2	1	3
Malnutrition			1		1
Marasmus:					
Luetic			3	4	7
Tuberculous			2	1	3
Migraine			1		1
Neuralgia			1		1
Ophthalmia			5	4	9
Otitis media			5	9	14
Ozena			2		2
Paralysis, postinfantile			2		2
Pharyngitis			3	1	4
Phimosis			6		6
Pertussis			2	2	4
Pneumonia, bronchial			4	2	6
Rachitis			2	5	7
Scabies				2	2
Sciatica			1		1
Scoliosis			2		2
Stomatitis			2	7	9
Tinea capitis			1		1
Tinea circinata			1		1
Tonsillitis			3	5	8
Tracheitis				1	1
Ulcer of leg			1		1
Vaginitis				2	2
Undiagnosed			8	20	28
Total			163	213	376
Revisits					487
Dermatology.					
Acne vulgaris			11	13	24
Alopecia areata			2		2
Burn, second degree				1	1
Callous				1	1
Chancroid			1	1	2
Chlolasma				1	1
Condylomata				2	2
Cyst, retention				1	1
Dermatitis:					
Medicamentos			1	8	9
Venenata			1	1	2
Digitate wart				4	4
Ecthyma			5		5
Eczema			22	12	34
Impetigo			3	4	7
Impetigo contagiosa			5	3	8
Keratosis, pigmentary			1		1
Keloid				1	1
Lupus vulgaris			1	1	2
Pityriasis alba				2	2
Scabies			5	1	6
Seborrhea			8		8
Sycosis, nonparasitica			2		2
Syphilis, secondary			13	20	33
Tinea tonsurans			20	2	22
Urticaria			8	6	14
Undiagnosed			18	21	39
Total			127	106	233
Revisits					379

Medical and surgical diseases—out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
Tuberculosis.					
Pulmonary tuberculosis	....	....	25	35	60
Total	....	....	25	35	60
Revisits	....	....	....	....	96
Ear, nose, and throat.					
Abscess, peritonsillar	....	....	12	7	19
Adenoids	....	1	27	49	77
Cerumen, impaction of	....	....	7	2	9
Epistaxis	....	....	7	9	16
Foreign body: Throat	....	....	7	11	18
Faucitis, acute	....	....	1	....	1
Furuncle, ear	1	....	....	2	3
Gumma of palate	....	....	2	1	3
Laryngitis:					
Acute	3	....	27	33	63
Chronic	....	....	18	10	28
Specific	....	....	5	2	7
Lingual varix	....	....	1	....	1
Nasopharyngitis	....	1	5	11	17
Nasal septum, ulceration of	....	....	2	....	2
Otitis externa	....	....	1	3	4
Otitis media:					
Acute	....	....	2	7	9
Chronic	....	....	7	11	18
Pharyngitis:					
Acute	5	....	32	27	64
Chronic	....	....	18	13	31
Specific	....	....	17	5	22
Rhinitis:					
Acute	....	....	10	3	13
Hypertrophic	....	....	2	1	3
Tonsillitis:					
Acute	3	1	22	31	57
Follicular	....	....	13	20	33
Tonsils, hypertrophy of:					
Faucial	....	....	96	113	209
Lingual	....	....	2	1	3
Turbinate bones, hypertrophy of	....	....	10	11	21
Ulvulitis	....	....	1	....	1
Undiagnosed	....	....	29	37	66
Total	12	3	383	420	818
Revisits	....	....	....	....	1,011
Genito-urinary.					
Abscess, periurethral	....	....	1	....	1
Adenitis, inguinal	....	....	44	....	44
Chancre	....	....	24	....	24
Condylomata	....	....	2	....	2
Epididymitis	....	....	15	....	15
Hydrocele	....	....	1	....	1
Paraphimosis	....	....	6	....	6
Phimosis	....	....	51	....	51
Prostate gland, hypertrophy of	....	....	1	....	1
Prostatitis	....	....	10	....	10
Syphilis:					
Primary	....	....	24	....	24
Secondary	....	....	17	....	17
Tertiary	....	....	3	....	3
Stricture, urethral	....	....	12	....	12
Urethritis:					
Anterior	....	....	104	....	104
Posterior	....	....	46	....	46
Total	....	....	361	....	361
Revisits	....	....	....	....	1,080

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
Gynecology.					
Abscess:					
Pelvic	....	....	....	3	3
Vulvo-vaginal	....	....	....	10	10
Abortion, spontaneous	....	....	....	5	5
Adentitis, inguinal	....	....	....	17	17
Adhesions, post-operative	....	....	....	11	11
Amenorrhea	....	....	....	5	5
Caruncle, urethral	....	....	....	5	5
Carcinoma uteri	....	....	....	5	5
Cervicitis	....	....	....	4	4
Chancroid	....	....	....	8	8
Condylomata	....	....	....	22	22
Cysts, ovaran	....	....	....	5	5
Cystitis	....	....	....	15	15
Cystocele	....	....	....	14	14
Dysmenorrhea	....	....	....	26	26
Endocervicitis	....	....	....	20	20
Endometritis	....	....	....	15	15
Fibroma uteri	....	....	....	40	40
Gonorrhea, acute	....	....	....	10	10
Hernia, umbilical	....	....	....	3	3
Lacerations:					
Cervix	....	....	....	26	26
Perineum	....	....	....	39	39
Lues	....	....	....	27	27
Mastitis	....	....	....	4	4
Menopause	....	....	....	27	27
Menorrhagia	....	....	....	5	5
Ovaritis	....	....	....	25	25
Pregnancy	....	....	....	96	96
Salpingitis:					
Acute	....	....	....	46	46
Chronic	....	....	....	20	20
Pyosalpinx	....	....	....	9	9
Uterine displacements:					
Antiversion	....	....	....	26	26
Prolapse	....	....	....	10	10
Retroversion	....	....	....	36	36
Uterine, subinvolution	....	....	....	20	20
Vaginitis	....	....	....	11	11
Vulvitis	....	....	....	20	20
Undiagnosed	....	....	....	39	39
Total	....	....	....	729	729
Revisits	....	....	....	....	1,258
Eye.					
Ambiyopia	....	....	2	1	3
Angiosclerosis	....	....	....	1	1
Aphakia	....	....	2	....	2
Arterio-sclerosis	....	....	5	2	7
Atrophy, optic	....	....	4	2	6
Astigmatism:					
Hyperopic	....	1	15	49	65
Myopic	....	1	11	20	32
Blepharitis, marginatis	....	....	6	12	18
Burn of eye	....	....	1	2	3
Cataract	....	....	14	18	32
Chalazion	1	2	10	14	27
Circumcorneal hypertrophy	....	....	2	1	3
Choked disk	....	....	2	1	3
Choroido-retinitis	....	....	18	11	29
Choroido-iritis	....	....	5	2	7
Conjunctivitis:					
Catarrhal	....	....	11	16	27
Follicular	....	....	2	11	13
Phlyctenular	....	....	11	19	30
Gonorrheal	....	....	3	4	7
Purulent	....	....	1	2	3
Traumatic	....	....	5	2	7

Medical and surgical diseases—out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
Eye—Continued.					
Corneal ulcer			8	17	25
Dacyrocystitis			4	2	6
Ecchymosis, subconjunctival			9	2	11
Episcleritis			1	3	4
Foreign body in eye	2	1	14	3	20
Glaucoma			6	14	20
Hordeolum			11	8	19
Iritis			21	13	34
Iridocyclitis			4	2	6
Keratitis			7	4	11
Kerato-iritis			4	1	3
Keratitis, phlyctenular				2	2
Muscal volitantes			1	3	4
Myopia			3	7	10
Palpebral edema			2	3	5
Paralysis:					
Sixth nerve				1	1
Third nerve			2		2
Phthisis bulbi			1		1
Phlyctenular ophthalmitis			14	7	21
Presbyopio			1	9	10
Pterygium			4	2	6
Refractions		3	89	187	279
Retinitis			8	28	36
Retinitis, neuro			2	16	18
Strabismus:					
External		1	2	5	8
Internal			4	7	11
Subconjunctival hemorrhage			1	2	3
Undiagnosed			27	39	66
Total	3	9	376	577	965
Revisits					2,060

Statistical summary.

	1919					1918				
	White.		Colored.		Total.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.	
In hospital, July 1, 1917						1	1	88	154	244
In hospital, July 1, 1918:										
Pay patients			10	28	38					
Indigent—										
United States			37	41	78					
District of Columbia			46	56	102					
Total			93	125	218	1	1	88	154	244
Admitted:										
Pay patients	1	6	302	573	882	4	2	191	366	563
Pay patients, births			34	43	77			22	24	46
Indigent—										
United States	10	1	398	556	965	8	2	477	673	1,160
District of Columbia	5	4	701	949	1,659	14	2	630	932	1,578
Births—										
United States			64	52	116			71	91	162
District of Columbia			69	84	153			70	69	139
Total admitted	16	11	1,568	2,257	3,852	26	6	1,461	2,155	3,648
Total under care, indoor	16	11	1,661	2,382	4,070	27	7	1,549	2,309	3,892
Stillbirths:										
Pay patients			1	4	5				2	2
Indigent			9	15	24			19	17	36
Total			10	19	29			19	19	38
Deaths:										
Pay patients			23	41	64			15	25	40
Indigent			144	142	286	1		156	157	314
Total			167	182	350	1		171	182	354

Statistical summary—Continued.

	1919					1918				
	White.		Colored.		Total.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.	
Discharged, including births:										
Pay patients—										
Recovered					476					312
Improved					304					151
Unimproved					42					29
Not treated					68					55
Total					890					547
Indigent—										
Recovered					1,360					1,637
Improved					1,046					902
Unimproved					216					223
Not treated					16					11
Total					2,638					2,773
Grand total discharged					3,878					3,674
In hospital, July 1, 1919:										
Pay patients			14	29	43			10	28	38
Indigent—										
United States			33	43	76			37	41	78
District of Columbia			30	43	73			46	56	102
Total indigent			63	86	149			83	97	180
Grand total remaining			77	112	192			93	125	218
Days maintenance:										
Pay patients					12,873					7,655
Indigent—										
United States					20,514					35,572
District of Columbia					39,888					39,951
Officers and employees					38,638					38,978
Total					111,913					122,156
Cost of patients, per day					$1.86					$1.36
Largest number of indigent patients at any one time					218					242
Smallest number of indigent patients at any one time					134					171
Daily average number of patients, pay and indigent					169.7					227.8
Number admitted from the District of Columbia, including births, indigent					1,810					1,717
Number admitted from the United States, including births, indigent					1,049					1,322
Number of prescriptions compounded:										
Indoor					26,540					26,274
Outdoor					4,368					8,095

FINANCIAL STATEMENTS.

BOARD OF CHARITIES ACCOUNT.

July 1, 1918, to June 30, 1919.

	Adults.	Children.	Babies.	Total.
In hospital, July 1, 1918	77	20	5	102
Admitted	1,451	208	153	1,812
Total	1,528	228	158	1,914

Appropriation	$40,000
Bills rendered	40,000

ALLOTMENT OF APPROPRIATION FOR SALARIES.

[Under requirement of act of Congress approved June 25, 1909 (35 Stat., 992).]

	Per annum.
Surgeon in chief	$3,000
Assistant surgeon	1,200
Resident physician	1,200
Pathologist	2,000
Anesthetist	1,200
Clerk	1,400
Clerk, assistant	700
Clerk, assistant	636
Pharmacist	720
Pharmacist, assistant	120
Steward	720
Superintendent of nurses	1,080
Superintendent of nurses, assistant	600
Night supervisor of nurses	480
Head nurses (2 at $480)	960
Engineer	1,400
Engineer, assistant	1,100
Engineer, assistant	1,000
Plumber	960
Firemen (3 at $720)	2,160
Telephone operator	$360
Seamstress	300
Nurses (48 at $60)	2,880
Orderly	300
Orderlies (4 at $240)	960
Orderly, night	340
Maids (3 at $168)	504
Head cook	840
Second cook	360
Third cook	288
Waiters (3 at $180)	540
Driver	408
Driver	360
Laundryman	420
Laundresses (5 at $156)	780
Laborer	240
Laborer	204
Laborer	240
Laborers (2 at $200)	400
	33,309

RECEIPTS AND DISBURSEMENTS.

RECEIPTS.

Appropriation, sundry civil act:		
For support	$46,000.00	
Salaries	33,360.00	
		$79,360.00
Appropriations, District of Columbia (under contract with Board of Charities)		39,856.10
Pay patients		17,878.80
Total		137,094.90

DISBURSEMENTS.		Unexpended balances.
Miscellaneous:		
Fuel, light, clothing, forage, medicine, etc	$41,993.90	$6.10
Pay patients	7,785.75	48.70
Subsistence	43,665.22	190.88
Pay patients	5,488.14	.....
Salaries	33,160.26	199.74
Pay patients	3,741.56	.....
Refunds, pay patients	814.65	.....
Total disbursements	136,649.48	
Total unexpended balance		445.42

Miscellaneous expenditures.

Class No.		1919	1918
1	Stationery and drafting supplies	$596.49	$492.34
2	Hardware and metals:		
	Hardware	256.21	764.48
	Metals	159.88	24.90
3	Dry goods and wearing apparel, cordage	4,215.98	2,257.95
4	Drugs and medicines:		
	Chemicals and reagents	2,924.70	3,132.65
	Wines and whisky		97.63
5	Laboratory, hospital appliances, surgical instruments, etc.:		
	Laboratory	70.52	234.12
	Hospital appliances	3,631.22	1,877.55
	Surgical	284.80	1,400.59
6	Electrical, engineering and plumbing supplies	291.46	544.07
7	Lumber, millwork and building material	40.02	59.50
8	Paints, oils, brushes, etc.:		
	Brushes	67.28	7.22
	Oils, paints, and painters' supplies	493.98	328.85
10	Household supplies:		
	Cleaning	196.28	243.45
	Laundry	1,493.83	1,680.29
	Miscellaneous	1,207.51	797.60
11	Forage and seed	$252.65	$331.69
12	Photographic supplies	151.61	181.50
14	Fuel:		
	Charcoal		10.36
	Coal, anthracite	70.15	226.70
	Coal, bituminous	25,841.37	20,391.29
	Wood	39.00	45.00
15	Incandescent electric lamps	160.36	139.68
20	Telephone service	434.06	451.14
	Heat, light, and power service:		
	Gas	1,012.13	893.14
	Hauling ashes	774.36	479.19
	Telegrams	7.47	2.52
	Books and periodicals	30.80	46.95
	Sundries (unclassified miscellaneous)	305.42	116.83
	Repairs and construction:		
	Buildings	896.38	698.10
	Heating plant	1,775.27	578.60
	Instruments	103.90	107.75
	Kitchen utensils		47.66
	Laboratory		200.50
	Laundry	248.24	166.55
	Office	29.17	4.60
	Stable and ambulance	1,411.15	811.22
	Miscellaneous	106.00	88.71
	Total	49,579.65	39,932.87

Subsistence expenditures.

Class No.		1919	1918
10	Beverages:		
	Cocoa	$62.25	$77.51
	Coffee	330.87	279.96
	Tea	372.00	194.55
	Canned goods	2,428.01	1,190.80
	Condiments and flavors	164.51	88.95
	Cereal food products:		
	Barley	9.50	12.00
	Bread	4,112.54	3,153.40
	Corn flakes	218.00	82.10
	Cornstarch	33.06	17.40
	Crackers	76.35	115.25
	Cream of wheat	45.20	
	Flour	372.00	382.70
	Gelatine	116.50	80.00
	Hominy	15.90	29.73
	Macaroni	40.00	32.15
	Meal	66.12	81.80
	Oats, rolled	47.71	77.62
	Rice	158.08	102.46
	Spaghetti	19.10	26.70
	Tapioca	42.24	38.08
	Unclassified	542.50	583.47
	Dairy products:		
	Butter	4,537.08	4,125.70
	Buttermilk	93.26	154.68
	Cheese	35.85	25.58
	Cream	66.38	113.20
	Milk, fresh	4,838.38	4,016.24
	Milk, condensed	30.00	
	Eggs	2,627.70	2,102.90
	Butterine	511.01	
	Fish:		
	Clam bouillon	24.00	10.95
	Codfish	256.65	157.45
	Fresh	1,162.00	1,090.74
	Salt	31.54	
	Salmon	177.30	85.40
	Fowl:		
	Chicken	3,480.50	3,003.75
	Turkey	161.60	65.00
10	Fruits	$2,466.48	$531.50
	Ice	905.60	385.40
	Lard	417.99	176.53
	Mazola oil	115.50	
	Crisco		177.75
	Meats:		
	Bacon—		
	Breakfast	869.02	813.56
	Shoulder	591.04	751.09
	Beef—		
	Fresh	3,965.61	3,426.95
	Corned	451.91	209.77
	Chipped	348.50	217.58
	Soup shanks	275.53	196.16
	Ham, smoked	592.20	582.25
	Liver	355.37	187.24
	Mutton	3,034.65	
	Lamb		2,245.72
	Pork, fresh	463.04	250.76
	Sausage—		
	Fresh	148.41	28.69
	Smoked	252.41	18.19
	Tongue	130.03	
	Veal	708.56	258.41
	Saccharine products:		
	Sugar—		
	Cut	41.97	
	Granulated	1,513.08	1,867.89
	Powdered	1.80	5.10
	Syrup	76.39	41.25
	Vegetables	4,102.70	3,986.65
	Salt	19.88	18.15
	Chocolate		7.68
	Farina		47.74
	Molasses		21.00
	Soft drinks, ginger ale		10.20
	Vermicelli		1.49
	Total	49,153.36	38,062.92

Receipts and expenditures on account of pay patients.

	1919	1918
Receipts:		
Private room patients, at $1.50 per day	$9,619.50	
Private room patients, at $1.25 per day	301.25	$7,163.75
Ward patients, at $1.25 per day	4,837.50	
Ward patients, at $1.10 per day	220.00	2,676.30
Children, at 75 cents per day	592.50	
Children, at 65 cents per day	13.65	232.70
Babies, at 40 cents per day	322.40	227.60
Operations	1,615.00	926.00
X-ray photos	332.00	221.00
Obstetrical cases	25.00	
Examination of urine		3.00
Examination of blood		5.00
	17,878.80	11,455.35
Expenditures:		
Extra services (nurses, orderlies, maids)	3,741.56	2,803.94
Subsistence	5,488.14	6,228.33
Medical and surgical supplies	826.63	371.34
Miscellaneous (dry goods, repairs, improvements)	6,759.12	1,474.54
Refund of overpayment by patients	814.65	470.05
	17,630.10	11,348.20
Unexpended balance	248.70	107.15

NEEDS.

In the last annual report attention was drawn to several important items which had been urged in previous annual reports, but the necessities of war seemed to make it improper to press them very strongly at that time. These needs and others still exist, and now that the war is over, it appears proper that these items should be urged as never before, so that the ever-increasing and all-important work of this branch of the service may be kept not only to pre-war efficiency, but that this institution shall not lag in providing means for post-war conditions.

First and foremost is the question of wages. Since no relief from higher living costs is to be seen, an increase in the basic salaries of all employees is most urgent. During the period of the war, it was possible to prevail upon some of the employees to remain in the service, through appeals made on patriotic grounds, though at a great personal sacrifice on their part. Now that the war is over, appeals to patriotism can not be used to hold them. Some substantial inducement in the way of increased salaries must be offered. Especially should this be done for those who by reason of their special qualifications have made themselves almost indispensable. Those who fill the low-grade positions must not be forgotten. If the cost of living bears heavily upon those holding the higher positions, it bears cruelly heavy upon those filling the lower positions.

To meet this situation squarely, an increase of $18,876 must be provided to raise the basic salaries of all employees to a proper level consistent with the changed conditions.

Ten thousand dollars increase for subsistence, fuel and light, medicine, and surgical supplies is as urgently needed as the preceding item. The abnormally high cost of all necessaries of life and all articles used for hospital work, makes it quite certain that unless this amount is granted, there will be a deficit at the end of the fiscal year 1920.

Fifteen thousand dollars for general repairs of the hospital should be provided and made immediately available. This amount is urgent and necessary to put the hospital in proper state of repair and sanitary condition. The inside walls are unsightly for the want of plaster, pointing up, and painting. Many of the down spouts and much of the plumbing must be replaced, and practically new roofs are needed for all buildings.

Five thousand dollars for new equipment is urgent, including operating tables, instruments, invalid chairs, bedside chairs and wheel carts.

Sixty thousand dollars for a pathological building is also needed and should be provided without further delay, as being the only means for scientific study of disease.

Forty thousand dollars for a new ward for female venereal diseases.

Among the many important needs of the hospital to-day, none is more urgent than the construction of a new ward for the treatment and care of female syphilities. Ample space is already provided for male patients of this class, but no provision has ever been made for females.

It was said during the war that as a military necessity it was urgent to combat venereal diseases to keep the soldier and sailor fit to fight. What was true then is equally true in times of peace. Society should meet and defeat these, the greatest of all foes to society, by making itself fit to live.

Twenty thousand dollars for enlarging the nurses' home, so as to provide ample room for more nurses is needed. It is utterly impossible for 48 pupil nurses to give a full measure of nursing service to all patients in a hospital with 278 beds, the number provided here. Again, no nurse should be kept on duty more than eight hours in twenty-four, which we are forced to do on account of an insufficient number.

Twelve thousand dollars for fencing and beautifying the hospital grounds should be provided.

The force of employees should be supplemented by the addition of the following:

	Per annum.
A roentgenologist, at	$1,800
A dietitian, at	1,400
An assistant anesthetist, at	1,000

The foregoing needs may seem pretentious to many unacquainted with the hospital situation, but all are urgent, and the sums of money requested as outlined therewith, if provided, would give the hospital ample facilities for greatly augmenting the character and standard of the work and make it possible to operate the same with the highest degree of efficiency.

TRAINING SCHOOL FOR NURSES.

The work of this department was conducted along the lines indicated in the last annual report. There was more illness among the nurses than ever before, a total of 229 days being lost, principally due to the influenza epidemic.

Special instruction in dietetics at Howard University was continued during the year, also the course in public health nursing was given by the District of Columbia League of Nursing Education at the Central Registry.

Only two nurses could be spared to take the two months' practical experience with the Instructive Visiting Nurse Society and Infant Welfare. Eight of the former graduates entered the military nursing service and are stationed at camps in Ohio.

The graduating exercises were held May 6, 1919, in Andrew Rankin Memorial Chapel, 15 women graduating as nurses, making a total of 321 holding diplomas of the school.

Graduates of 1919.

Ruth Bell, St. Joseph, Mo.
Mae Brown Brandford, Boston, Mass.
Georgia Frankie Byrd, Jacksonville, Fla.
Esther Bell Culberson, Clinton, Iowa.
E. Mae Culberson, Chicago, Ill.
Bertha May Davis, Bridgeport, Conn.
Marie E. V. Davis, Boston, Mass.
Ruth Freeman, Painesville, Ohio.
Amelia Jackson Gears, Providence, R. I.
Othelia Ruth Johnson, Norfolk, Va.
Marcena Legall, Barbadoes, British West Indies.
Rhonie White, Talledega, Ala.
Edna Wooten, Painesville, Ohio.
Isabel Worsham, Piqua, Ohio.
Lilly Mae Wyms, Atlanta, Ga.

Applications, resignations, dismissals, etc.

Applications received during year	140	Resigned	3
Applicants taken on probation	22	On probation	8
Accepted after probation	10	Dismissed	2
Not accepted after probation	5		

Lectures.

The course of lectures was delivered by the following staff:

Diseases of children	A. B. McKinney, M. D.
Gynecology	J. E. H. Taylor, M. D.
Anatomy and physiology	S. L. Carson, M. D.
Hygiene	C. A. Brooks, M. D.
Theoretical nursing	Laura R. MacHale.
Practical and theoretical nursing	Emma M. Irwin.
Diseases of the eye	M. O. Dumas, M. D.
Medical nursing	E. C. Terry, M. D.
Obstetrics	E. D. Williston, M. D.
Materia medica and therapeutics	John W. Mitchell, M. D.
Urinalysis and bacteriology	B. Price Hurst, M. D.
Neurology	Evelyn Mitchell, M. D.
Ear, nose, and throat	H. Martin, M. D.
Surgical nursing	William A. Jack, M. D.
Dietetics	Gertrude Shelton.
Orthopedics	C. A. Allen, M. D.
Infectious diseases	P. M. Murray, M. D.

NURSING STAFF.

Superintendent of nurses	1
Assistant superintendent of nurses	1
Graduate head nurses	3
Night supervisor of nurses	1
Graduates of class of 1919 still in hospital	10
Senior pupil nurses	17
Intermediate pupil nurses	12
Junior pupil nurses	3
Probationers	8

Course in cooking, theoretical and practical.

	THEORY.	PRACTICAL WORK.
1.	Water food	Coffee, tea, barley water, lemonade.
2.	Carbohydrates—starch	Gruels, toast, Zwieback.
3.	Carbohydrates—cellulose	Cereals and vegetables.
4.	Carbohydrates—sugar	Fruits, sirups, jelly.
5.	Fats and oils—salads	Salads, salad dressing, butter, cream.
6.	Proteids—milk	Pasteurized, peptonized, koumiss.
7.	Proteids—eggs	Cooked in shell, poached, omelets.
8.	Proteids—milk and eggs	Custards, eggnogs, egg lemonade.
9.	Proteids—meat and fish	Broiling, roasting, meat sandwiches.
10.	Proteids—meat	Beef juice, beef extract, broth.
11.	Proteids—gelatin	Chicken jelly, veal jelly, beef jelly.
12.	Review carbohydrates	Sponge cake, ice cream, water ices.

Three-year schedule.

Ward.	Day duty.	Night duty.
SURGICAL EXPERIENCE.	*Months.*	*Months.*
Male	2	1
Female	2	1
Genito-urinary	1	1
Gynecological	4	2
Orthopedic	1	1
Emergency operating room	1	1
Main operating room	3	.....
Obstetrical	2	1
MEDICAL EXPERIENCE.		
Male	3	1
Female	3	1
Children	2	1
Diet kitchen	1	.....
Total	25	11

Occupation and residence of graduates.

1896.

Ashton, Luci V. (Mrs. Woods), Kansas City, Mo.
Blackburn, N. L., private nurse, Philadelphia, Pa.
Burke, Julia (Mrs. Phillips), Jacksonville, Fla.
Fleetwood, Sara I., deceased.
Foust, Isabella L., private nurse, Winston, N. C.
Gibson, Katherine C., Bureau of Engraving and Printing, Washington, D. C.
Green, Anna N., deceased.
Owens, Laura A., private nurse, Washington, D. C.
Pierce, Letitia (Mrs. Blair), Washington, D. C.
Ricks, Antoinette M. (Mrs. Demby), Kansas City, Mo.
Robinson, Annie B., superintendent and matron, Good Samaritan Hospital, Charlotte, N. C.
Shorter, Sarah A., private nurse, Washington, D. C.

1896.

Simms, Annie A. (Mrs. Johnson), Baltimore, Md.
Smith, Gertrude (Mrs. Thorn), Washington, D. C.
Tyler, Elizabeth, district nursing, New York City.

1897.

Caldwell, Amanda J. (Mrs. Darrell), Dallas, Tex.
Combs, Annie, massage specialist, Washington, D. C.
Green, Lucille (Mrs. Tibbs), St. Paul, Minn.
Griffin, G. Josephine, private nurse, Washington, D. C.
Haithcock, Ada, private nurse, Washington, D. C.
King, Annie C. (Mrs. Hughes), Richmond, Va.
Rollins, Willie M. (Mrs. Frazier), Washington, D. C.

Occupation and residence of graduates—Continued.

1897.

Smith, S. May, private nurse, Troy, N. Y.
Thomas, Annie M., private nurse, Washington, D. C.
Thompson, Della R. (Mrs. Davis), Vienna, Va.
Underhill, Katherine P. (Mrs. Wm. Moten), Washington, D. C.
Webb, Eva, private nurse, Washington, D. C.
Warner, Florence A., private nurse, Springfield, Mass.
Young, Lola E. M., private nurse, Greenville, S. C.

1898.

Bannister, Carrie J. (Mrs. Knox), Washington, D. C.
Bennett, Florence R., private nurse, Baltimore, Md.
Cabannis, Martha E., night supervisor, Freedmen's Hospital, Washington, D. C.
Carter, Edith M., private nurse, New Rochelle, N. Y.
Davis, Annie M., private nurse, Shelbyville, Tenn.
Ennis, Sarah J. (Mrs. Brooks), Washington, D. C.
Gaines, Mary R., private nurse, Berkeley, Calif.
Geder, Isabella, private nurse, Binghamton, N. Y.
Hurlong, Mary A., private nurse, Asheville, N. C.
King, Carrie M. (Mrs. Foreman), Washington, D. C.
Robinson, Amelia A., private nurse, Nashville, Tenn.
Russell, Ruby E., private nurse, Charlottesville, Va.
Stanton, Priscella (Mrs. Todd), Pittsburgh, Pa.
Sumby, Lillie May, private nurse, Washington, D. C.
Valentine, J. Ella, private nurse, Lebanon, Ind.
Whitson, Clara E. (Mrs. Howe), Washington, D. C.

1899.

Banks, Effie P. (Mrs. Sykes), Indianapolis, Ind.
Brown, Agnes M., private nurse, Meyersdale, Pa.
Coleman, Georgia A., private nurse, Washington, D. C.
Dismond, S. Matthew (Mrs. Dibble), St. Louis, Mo.
Francis, Bertha A., head nurse, Home Hospital, Birmingham, Ala.
Hairston, Lula C. (Mrs. Crews), Winston, N. C.

1899.

Hankins, Mintha C., private nurse, Washington, D. C.
Hendricks, Eliza R. (Mrs. Brown).
Henry, Lillian M., private nurse, Downingtown, Pa.
Hoge, Carrie M., private nurse, Washington, D. C.
Keemer, Jessie E. (Mrs. Robinson), Providence, R. I.
McEwen, Irene O. (Mrs. Green), Pensacola, Fla.
Rich, Anna, private nurse, Hartford, Conn.
Scott, Helen V. (Mrs. Cole), Swansboro, Ga.
Thompson, Isabella, private nurse, New Orleans, La.
Wilson, Emma C., private nurse, Montgomery, Ala.
Williams, Elmira E., deceased.

1900.

Clarke, Mary F., private nurse, Richmond, Va.
Hamilton, Priscilla, deceased.
Hawkins, Nannie E., private nurse, Charlotte, N. C.
Hunton, Mary A. (Mrs. Gordon), St. Louis, Mo.
Johnson, Hattie B. (Mrs. Cunningham), Owensboro, Ky.
Lewis, Eva P., private nurse, Manassas Va.
Mickens, Marcella C., private nurse, Pittsburgh, Pa.
Middleton, Haga H., private nurse, Charleston, S. C.
Moody, Annie L., private nurse, Washington, D. C.
Smith, Cora V., private nurse, Camden, N. J.
Winfield, Laura, private nurse, Ware, Mass.

1901.

Allen, Margaret A., public health nurse, Jacksonville, Fla.
Barks, Susan C., visiting nurse, Jacksonville, Fla.
Campbell, B. N., private nurse, Montgomery, Ala.
Dey, Mary L., private nurse, Philadelphia, Pa.
Hackley, Mamie E. (Mrs. Ash), Philadelphia, Pa.
Hanson, Carrie L., private nurse, Baltimore, Md.
Harrell, Catherine S. (Mrs. Butler), Texas.
Hunter, Bessie, private nurse, Washington, D. C.
Jackson, Eliza A., private nurse, Richmond, Va.

Occupation and residence of graduates—Continued.

1901.

Jones, Mary J., private nurse, Washington, D. C.
Powell, Gussie D., private nurse, Richmond, Va.
Rhone, Charlotte S., private nurse, Newbern, S. C.
Robinson, Frances A., private nurse, Newbern, N. C.
Thomas, Bertha J., head nurse, Freedmen's Hospital, Washington, D. C.
Walcott, Louisa M., private nurse, Rockhill, S. C.
Whitley, Florence A., private nurse, Newbern, N. C.

1902.

Adams, Ella C., private nurse, Philadelphia, Pa.
Baker, Vera L., head nurse, State Hospital, Goldsboro, N. C.
Booth, Mary S., private nurse, Washington, D. C.
Eelisse, Augusta V., private nurse, Brooklyn, N. Y.
Dias, Frances C., private nurse, Philadelphia, Pa.
Johnson, Getrrude B., private nurse, Niagara Falls, N. Y.
Mason, Corinna (Mrs. Phillips), Springfield, Mass.
Nichols, Florence L. (Mrs. Avant), Charlotte, N. C.
Rogers, Amanda, private nurse, Indianapolis, Ind.
Roper, Maggie A., private nurse, Galveston, Tex.
Thompson, Rachel A. (Mrs. Thomas), deceased.

1903.

Balentine, J. L. (Mrs. Dial), Jacksonville, Fla.
Browne, E. M., head nurse, Douglass Hospital, Philadelphia, Pa.
Baltimore, Mary E., private nurse, Harrisburg, Pa.
Christie, Sarah E. (Mrs. Selah), Chester, Pa.
Coates, Maiella E., private nurse, Washington, D. C.
Hargrave, L. S., private nurse, Trenton, N. J.
Johnson, L. D., private nurse, Warrenton, N. C.
Johnson, Nellie V., private nurse, Abbeville, S. C.
Latney, Carrie L. (Mrs. Bowie), Washington, D. C.
Love, Ellen V., private nurse, Lumberton, N. C.
Purcell, E. J., private nurse, Brunswick, Ga.

1903.

Rollins, Clara A., private nurse, Washington, D. C.
Rutherford, Anna L., private nurse, Kingston, N. C.
Sharp, Carrie M. (Mrs. Morgan), Petersburg, Va.
Yarborough, S. V. S. (Mrs. Allen), Columbus, Ga.

1904.

Baker, Hattie E., private nurse, Darlington, S. C.
Blackwell, W. Lucille (Mrs. Morris), New York, N. Y.
Carter, Mary E., private nurse, Rippon, W. Va.
Carter, Elizabeth V., head nurse, Mercy Hospital, Philadelphia, Pa.
Grant, Anna E. (Mrs. Millen), Savannah, Ga.
Gilmore, Mary E., private nurse, Leavenworth, Kans.
James, Aleathia D. (Mrs. Franklin), Jacksonville, Fla.
Jeffries, Emma M., private nurse, Redbank, N. J.
Jones, Violet, private nurse, Hartford, Conn.
Lewis, Louzetta (Mrs. Mitchell), Montgomery, Ala.
Richardson, Effie V. (Mrs. McCoy), Washington, D. C.
Thomas, Marie E. (Mrs. Jones), Topeka, Kans.

1905.

Braxton, Margaret, private nurse, Hartford, Conn.
Brooks, Alpha E. (Mrs. Jones), Fairmont Heights, D. C.
Carter, Marion M., private nurse, Washington, D. C.
Henderson, Hattie E., private nurse, Cleveland, Ohio.
Holmes, Julia E., private nurse, Plainfield, N. J.
Jefferson, Roxanna M., private nurse, Bristol, Tenn.
Kidd, Bertha M. (Mrs. Harris), Washington, D. C.
Long, Ida E., private nurse, Newark, N. J.
Maston, Mary J., head nurse, Red Cross Sanitarium, Louisville, Ky.
Scott, Julia E., private nurse, New Haven, Conn.
Teabout, Stella, private nurse, Richfield Springs, N. Y.
Taliaferro, Olivia, private nurse, Anacostia, D. C.
Terry, Jessie C., private nurse, Los Angeles, Calif.

Occupation and residence of graduates—Continued.

1905.

Williams, Daisy M. (Mrs. Moten), Sherman, Tex.
Williams, Mary T., private nurse, Ware Neck, Va.
Wilson, Annabel, private nurse, Baltimore, Md.

1906.

Barnes, Annie, private nurse, Baltimore, Md.
Bearce, Daisy M., private nurse, Rye, N. Y.
Burress, Mary E. (Mrs. Wormley), Ardwick, S. C.
Gordon, Mary B., private nurse, Washington, D. C.
Hall, Iona M., private nurse, Troy, Ohio.
Henderson, Sara O., private nurse, Newport, R. I.
Johnson, Harriett C., private nurse, Cleveland, Ohio.
Lewis, Willie A., private nurse, Atlanta, Ga.
Lucas, Marion V. (Mrs. Monroe), Washington, D. C.
McDougal, Colota M., district nurse, Indianapolis, Ind.
McKnight, Viola, superintendent of nurses, Mercy Hospital, Philadelphia, Pa.
Marshall, Mary E., private nurse, Morristown, Tenn.
Merritt, Mary E., superintendent of nurses, Mitchell Hospital, Leavenworth, Kans.

1907.

Bullock, Blanche V., private nurse, Richmond, Va.
Childs, Helen D., private nurse, Philadelphia, Pa.
Escoffery, Lula M., private nurse, Atlantic City, N. J.
Harmon, Nannie M., private nurse, Tip Top, Va.
Porter, Susan H., dean woman's department, Tuskegee, Ala.
Payton, Lillian M., public school nurse, Washington, D. C.
Peck, Alice M. (Mrs. Anderson), Boston, Mass.
Rose, Julia M., private nurse, Lynchburg, Va.
Slocum, Mary E., private nurse, Providence, R. I.
Smith, Minnie M., private nurse, Amherst, Mass.
Taylor, Loretta P. (Mrs. Banks), Washington, D. C.
Wright, Nena J. (Mrs. Jackson), New York City.

1908.

Briggs, Cornelia K., private nurse, Troy, N. Y.
Denning, Clara S. (Mrs. Robinson), Baltimore, Md.
Douglas, Kate E. (Mrs. Barter), Newark, N. J.
Donaldson, Vesta I., private nurse, Ocean Grove, N. J.
Fray, Julia (Mrs. Clark), Chicago, Ill.
Henderson, Jamima S., private nurse, Spring Lake, N. J.
Jones, Bertie L., deceased.
Nicholas, Beatrice E., private nurse, Baltimore, Md.
Proctor, Eva M., private nurse, Newark, N. J.
Robinson, Alice E., private nurse, Hartsville, S. C.
Reynolds, Agnes, private nurse, Ironton, Ohio.

1909.

Allen, Irene P. (Mrs. Martin), deceased.
Burnett, Sarah L., private nurse, Washington, D. C.
Coates, Nana E., Battle Creek, Mich.
Curtis, Minnie M., private nurse, Marietta, Ohio.
Green, Lillian C. (Mrs. Davis), Washington, D. C.
Hall, Anita B., private nurse, Baltimore, Md.
Hankle, Areatha B. (Mrs. Bailey), St. Louis, Mo.
Johnson, Lillian A., private nurse, Poughkeepsie, N. Y.
Lewis, Charlotte M., private nurse, Atlanta, Ga.
Parker, Mary E., private nurse, Williamsport, Pa.
Sheppard, Emma D., private nurse, Meyersdale, Pa.
Smith, Annie M., private nurse, Jacksonville, Fla.
Spears, Lillian, private nurse, Providence, R. I.
Wainwright, Melinda E., Charles Town, W. Va.

1910.

Amby, Grace, married, Baltimore, Md.
Brown, Nellie V., private nurse, Meyersdale, Pa.
Howard, Mrs. Sankey B., Goldsboro, N. C.
Gates, Eugene J. P., private nurse, Washington, D. C.
Gilliam, Octavia T., private nurse, Hanover, Va.
Hutchinson, Mabel M., private nurse, Lockport, N. Y.

Occupation and residence of graduates—Continued.

1910.

Jackson, Sara E., private nurse, Steelton, Pa.
Jordan, Maggie M., private nurse, Washington, D. C.
McClaine, Nettie L. (Mrs. George), Paducah, Ky.
Richardson, Lizzette S., private nurse, Washington, D. C.
Reid, Marion M., privte nurse, Denver, Colo.

1911.

Blackburn, Clara E. (Mrs. Miller), Wheeling, W. Va.
Clay, Eva Virginia, Central State Hospital, Petersburg, Pa.
Coates, Edna May (Mrs. Gloster), visiting nurse, Brooklyn, N. Y.
Green, Emily Estella (Mrs. Allen), Washington, D. C.
Grisby, Sara Elizabeth, private nurse, Washington, D. C.
Harris, Florence M., visiting nurse, Brooklyn, N. Y.
Hopkins, Jennie C., private nurse, New York City.
Patton, Jesse Boyd, superintendent of nurses, Mercy Hospital, Nashville, Tenn.
Piper, Ida J., (Mrs. Robinson), Boston, Mass.
Price, Mae Irene (deceased).
Stevens, Nettie Bentley, private nurse, Atlanta, Ga.
Thompson, Lulu E., head nurse, Freedman's Hospital, Washington, D. C.
York, Martella M., head nurse, Freedman's Hospital, Washington, D. C.

1912.

Abner, Carrie (Mrs. Bumbry), Chicago, Ill.
Butler, Marguerite C. (Mrs. Scott), Philadelphia, Pa.
Carter, Elizabeth F. A., Public Health nurse, San Antonio, Tex.
Christian, Estella A., private nurse, Richmond, Va.
Eaton, Sadie E., private nurse, Raleigh, N. C.
Simmons, Mary A. (Mrs. Moore), Magnolia, N. J.

1913.

Anderson, Maude H., private nurse, Philadelphia, Pa.
Barnes, Mayme, Central State Hospital, Petersburg, Va.
Berkley, Pearl B., private nurse, Washington, D. C.
Davis, Alice E., private nurse, Frederick, Md.

1913.

Elliott, Frances R., Public Health nurse, Jackson, Tenn.
Garrott, Roberta Lee, private nurse, Washington, D. C.
Green, Cecilia M. (Mrs. Martin), Washington, D. C.
Henry, Eva G., private nurse, Wilmington, Del.
Howland, Elizabeth B., head nurse, Freedmen's Hospital, Washington, D. C.
Jackson, Edna V. (Mrs. Brooke), Kansas City, Mo.
Jordan, Emily M., private nurse, Washington, D. C.
Kemper, Etta C., Barnett Hospital, Huntington, W. Va.
Lawson, Bessie M., private nurse, Pittsburgh, Pa.
Meredith, Angie E. (deceased).
Ockrey, Minnie, visiting nurse, Newark, N. J.
Russell, Josephine M., private nurse, Washington, D. C.
Wingate, Elizabeth E., private nurse, Charleston, S. C.

1914.

Byrd, Carrie Lena, head nurse, Tidewater Hospital, Tidewater, Va.
Cargyle, Laura Aurelia, private nurse, Atlanta, Ga.
Clark, Ophelia Elizabeth, private nurse, Indianapolis, Ind.
Jackson, Alice Veronica, head nurse, Provident Hospital, Baltimore, Md.
Jordan, Blanche Lillian, private nurse, Washington, D. C.
Minor, Ethel Mae (Mrs. Bingham), Washington, D. C.
Mundin, Maude E., private nurse, Richmond, Va.
Robinson, Adaline, private nurse, Kansas City, Mo.
Shelton, Willie Belle, private nurse, Buffalo, N. Y.
Smith, Lena Mae (Mrs. Sampson), Washington, D. C.
Thompson, Edna Sylvia, private nurse, New York City.
Varner, Amanda Evalina, private nurse, Atlanta, Ga.
Walker, Olive Glennie, Public Health Service, Cleveland, Ohio.
Williamson, Lulu Howard (Mrs. Kingslow), Bluefield, W. Va.

1915.

Benson, Katherine Zada, private nurse, Washington, D. C.
Brown, Marion Hilda, private nurse, Bluefield, W. Va.

Occupation and residence of graduates—Continued.

1915.

Johnson, Helen Clotilda, private nurse, Wilkes-Barre, Pa.
Lovett, Caroline Beatrice (Mrs. Terry), Washington, D. C.
Martin, Alice Ellen, private nurse, Birmingham, Ala.
Owen, Christie Elaine (deceased).
Sheppherd, Mary J., private nurse, Meyersdale, Pa.
Spurlock, Pearl Mabel, private nurse, Pittsburgh, Pa.

1916.

Clifford, Helen Healy (Mrs. Jackson), Harpers Ferry, W. Va.
Gill, Edith Berncenia (Mrs. Milard), Washington, D. C.
Graham, Carrie Francis, private nurse, Boston, Mass.
Hammie, Lola Montice, private nurse, Washington, D. C.
Holmes, Cora Lee (Mrs. Hester), Norfolk, Va.
Lightfoot, Josephine Julia, private nurse, Berryville, Va.
May, Charlotte King, private nurse, Holton, Kans.
Marsh, Louise Veronica, (Mrs. Lucas,), Norfolk, Va.
Minnis, Nancy Jeanette, private nurse, Norfolk, Va.
Scott, Irene Rhodelia, private nurse, Atlanta, Ga.
Smith, Georgia Penn (Mrs. Reed), Washington, D. C.
Walker, Fannie Geneva, private nurse, Lockland, Ohio.
Weeks, Mary Viola, private nurse, Norfolk, Va.
Yeatman, Lucille Bernice, private nurse, Philadelphia, Pa.

1917.

Boulding, Susie M., private nurse, Washington, D. C.
Butler, Josephine M., private nurse, Hutchinson, Kans.
Brown, Irene, private nurse, Washington, D. C.

1917.

Chambers, Alice, private nurse, Baltimore, Md.
Cole, Aileen, private nurse, Washington, D. C.
Doyle, Mabel (Mrs. Keating), New York.
Edwards, Esther, private nurse, Washington, D. C.
Gillard, Lenore (Mrs. Kizer), Washington, D. C.
Harris, Sarah E., private nurse, Galveston, Tex.
James, Pauline (Mrs. Curtis), Washington, D. C.
Jones, Harriet W., private nurse, New York.
Lacount, Gertrude, private nurse, Providence, R. I.
Moses, Florence, private nurse, Washington, D. C.
Porter, Beatrice, private nurse, Chicago, Ill.
Smith, Inez, private nurse, Chicago, Ill.
Walker, Louise, private nurse, Galveston, Tex.
West, Jeanette, private nurse, Richmond, Va.
White, Arline, private nurse, Fayetteville, N. C.
Hill, Sophia, private nurse, Asbury Park, N. J.
Yancy, Edith, private nurse, Washington, D. C.

1918.

Coulbourne, Susie, private nurse, Washington, D. C.
Garbon, Marion, Y. M. C. A. work, Paris, France.
Harris, Nellie, private nurse, Washington, D. C.
Smith, Pearl M., visiting nurse, Washington, D. C.
Starks, Callie McGuinn, private nurse, Washington, D. C.
Strothers, Josephine, private nurse, Abington, Va.
Turnquest, Ruth, head nurse, Burrell Memorial Hospital, Roanoke, Va.
Wallace, Pearl, private nurse, Jacksonville, Fla.

Very respectfully,

W. A. WARFIELD,
Surgeon in Chief.

THE SECRETARY OF THE INTERIOR.

REPORT OF THE PRESIDENT OF HOWARD UNIVERSITY

ROSTER OF OFFICERS.

BOARD OF TRUSTEES FOR 1918–1919.

Ex-Chief Justice STANTON JUDKINS PEELE, LL. D., *president.*
JAMES STANLEY DURKEE, A. M., Ph. D., *president of the university.*
GEORGE WILLIAM COOK, LL. M., *secretary and business manager.*
EDWARD LAMAY PARKS, D. D., *treasurer and registrar.*

Term Expires 1919.

JUSTICE JOB BARNARD, LL. D., Washington, D. C.
WILLIAM VAN ZANDT COX, A. M., Washington, D. C.
Rev. FRANCIS JAMES GRIMKE, D. D., Washington, D. C.
CUNO HUGO RUDOLPH, Washington, D. C.
WILLIAM ALBERT SINCLAIR, M. D., Philadelphia, Pa.
Bishop JOHN HURST, D. D., Baltimore, Md.

Term Expires 1920.

JOHN THOMPSON EMLEN, Philadelphia, Pa.
THOMAS JESSE JONES, Ph. D., Washington, D. C.
Rev. JESSE EDWARD MOORLAND, D. D., Washington, D. C.
Hon. JAMES CARROLL NAPIER, LL. D., Nashville, Tenn.
CHARLES BURLEIGH PURVIS, M. D., Boston, Mass.
JAMES HENRY NELSON WARING, A. B., M. D., Washington, D. C.
MARCUS FITZHERBERT WHEATLAND, M. D., Newport, R. I.
Justice WENDELL PHILLIPS STAFFORD, Washington, D. C.

Term Expires 1921.

ROLFE COBLEIGH, Boston, Mass.
Justice GEORGE WESLEY ATKINSON, LL. D., Washington, D. C.
Rev. HARLAND PAUL DOUGLASS, D. D., New York City.
ANDREW FRANKLIN HILYER, A. B., LL. M., Washington, D. C.
Ex-Chief Justice STANTON JUDKINS PEELLE, LL. D., Washington, D. C.
Rev. ULYSSES GRANT BAKER PIERCE, D. D., Washington, D. C.
Rev. CHARLES HERBERT RICHARDS, D. D., New York City.

HONORARY BOARD.

JOHN ADAMS COLE, Chicago, Ill.
Bishop BENJAMIN FRANKLIN LEE, D. D., Wilberforce, Ohio.
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Hon. WILLIAM HOWARD TAFT, LL. D., New Haven, Conn.
Bishop BENJAMIN TUCKER TANNER, LL. D., Philadelphia, Pa.
Bishop WILBUR PATTERSON THIRKIELD, LL. D., New Orleans, La.
HENRY PELLEW, Washington, D. C.

PATRON EX OFFICIO.

Hon. FRANKLIN KNIGHT LANE, Secretary of the Interior.

REPORT OF THE PRESIDENT OF HOWARD UNIVERSITY.

HOWARD UNIVERSITY,
Washington, D. C., July 1, 1919.

SIR: I have the honor to submit for Howard University the following report, showing the condition of the institution on the 1st day of July, 1919, "embracing therein the number of pupils received and discharged or leaving the same for any cause during the year, and the number remaining; also the branches of knowledge and industry taught and the progress made therein, together with a statement showing the receipts of the institution, and from what sources, and its disbursements, and for what objects."

REGISTRATION.

As in all other similar educational institutions, the war made great inroads upon our student body. The Students' Army Training Corps brought to our college of arts and sciences 40 more students than were enrolled the previous year, but those students of sufficient age who were not prepared to enter the freshman class and thus try for a commission were placed in the Regular Army group. This reduced the number of students enrolled in the other departments, especially in the academy and commercial college. War conditions seriously affected the home life of many who would have sent their boys and girls to Howard. These two causes, therefore, account for a reduction of 223 in our total enrollment. The year closes with 1,360 students registered. These students come from 37 different States and 10 foreign countries.

Students during year ended June 30, 1919.

College of arts and sciences	375
Teachers' college	86
School of manual arts and applied science	80
Conservatory of music	198
School of religion	42
School of medicine	252
School of law	48
Academy	197
Commercial college	93
Total	1,371

Names duplicated because of students taking special courses in different departments	133
Net total	1,238
Correspondence students not counted above	122
Final total	1,360

The total number graduated was 146, distributed as follows:

Graduates in 1919.

College of arts and sciences	42
Teachers' college	16
Normal course	2
Kindergarten	2
School of religion	8
School of medicine:	
Medical college	19
Dental college	1
Pharmaceutic college	5
School of law	14
Academy	33
Commercial college	4
Total	146

GRADUATE SCHOOLS.

(I) THE SCHOOL OF MEDICINE.

The medical department of Howard University was established for the purpose of giving properly qualified colored people a first-class medical, dental, and pharmaceutic education. The department, especially the medical college, has endeavored to offer the best facilities possible. Because of its high standing and unusual hospital advantages, it has attracted students of practically all races and from all parts of the world.

The department has graduated to date 1,745 students—1,029 medical, 424 dental, and 292 pharmaceutical. Reports from the various communities in which these graduates live show that 90 per cent of them are doing well. A number of the graduates participated in the World's War and one, Dr. Thomas E. Jones, was given the distinguished-service medal. Dr. Albert Ridgeley was cited by the French Government and given the croix de guerre.

The department has been conducted practically from the money received from fees. To keep up with modern medical teaching, fees are inadequate; endowment must be secured.

The registration for session 1918–19 is as follows: Medical, 108; dental, 131; pharmaceutic, 14; total, 253. Of these 25 received degrees—19, M. D.; 1, D. D. S.; 5, Pharmaceutical Chemist.

(II) THE SCHOOL OF LAW.

The Howard University school of law was incorporated March 2, 1867, by act of Congress, and is located at 420 Fifth Street Northwest, Washington, D. C. The purpose of this department is the preparation of students for practice at the bar, for making them better citizens and more efficient civil servants, a large number of whom are employed by the Government.

The number graduating for the past 10 years is as follows:

1910	22	1915	23
1911	28	1916	20
1912	28	1917	20
1913	25	1918	20
1914	19	1919	14

The average enrollment for the past 10 years has been over 100. A decrease in the last two years in enrollment and the small graduating class of this year are due to a large number of the students being called to the colors during the war.

(III) THE SCHOOL OF RELIGION.

The primary purpose of the school of religion has been from the beginning to prepare men for the active pastorate. To this end Howard for years has been noted for its thorough training in the English Bible and for its discipline in sermon preparation. Two other purposes have been before those in authority, namely, to broaden the vision and to deepen the religious life of those who were to make teaching their profession and to equip those dedicated to the missionary field with the outlook and knowledge which would assist them in the difficult but splendid task.

The roll of students for the year was as follows: Day classes, 29; evening classes, 14; correspondence department, 122; total, less one duplication, 164. Of these 3 received the degree of B. D. and 5 received diplomas.

This school receives no aid, whatsoever, from Government funds.

ACADEMIC SCHOOLS.

THE COLLEGE OF ARTS AND SCIENCES.

The relatively small number in the upper classes is due to the fact that most of the male students were enlisted in the military service. The unprecedented increase in the freshman class was contributed to by the Students' Army Training Corps, which encouraged all male students of appropriate ages and proper preliminary training to enter the Students' Army Training Corps in preparation

for military duty. As in most American colleges, the requirements for admission were made somewhat more elastic in view of the military situation.

A large number of underclass men fell out with the demobilization of the Students' Army Training Corps. The work for the year has been greatly disturbed by reason of the influenza epidemic and readjustment of the program due to the exigencies of the military work.

The enrollment for the year is 375 against 355 of last year. The following is the enrollment by class and sex:

	Male.	Female.	Total.
Seniors	11	20	31
Juniors	23	11	34
Sophomores	44	19	63
Freshmen	206	26	232
Specials	7	8	15
	291	84	375

Of these 34 received the degree of A. B. and 9 the degree of B. S. Eleven students received certificates of special mention and honor because of their military service, though not able to obtain their degree.

THE TEACHERS' COLLEGE.

The enrollment is smaller this year than formerly because of the fact that many of the men were called to the colors and some are still with the American Expeditionary Forces in France. Another reason is because the committee on schedule and classification, who examined carefully each candidate for entrance, advised and recommended to some other department every student who was not to make teaching the main purpose of his collegiate course.

At the beginning of the year the classroom work of the students was interrupted both by the adjustment of the Students' Army Training Corps and the influenza epidemic. Students, however, manifested a fine spirit of cooperation with the acting dean and the faculty and have shown a commendable seriousness and zeal in their work.

Dean Moore has been away on leave practically the entire school year, loaned by the university to do war work and educational reconstruction work in the South. His classroom work has been distributed among other members of the teachers' college faculty and has been carried through the year without loss of time to the students.

There have been enrolled in the teachers' college this year 88 students from 21 different States and two foreign countries, distributed in class as follows:

Seniors	10
Juniors	16
Sophomores	15
Freshmen	33
Specials	8
Total	88

Of these seven received the degree of A. B. in education and nine the degree of B. S. in education.

THE SCHOOL OF MANUAL ARTS AND APPLIED SCIENCE.

During the summer of 1918 almost the entire equipment and laboratories of the department were used by the soldiers in the various branches of study pursued by them. As the equipment and woodworking rooms were still in use when school opened it was impossible to offer the regular courses in woodwork to students of the academy and commercial college. As the War Department required that all students registered in the Students' Army Training Corps should pursue a course in surveying and map making, it was necessary for the department to purchase additional civil engineering equipment. A large amount of equipment has been purchased for the electrical engineering department, so that in the future almost all the tests on electrical apparatus found in the best-equipped engineering laboratories will be performed by our own laboratories, including both elementary and advanced testing.

The registration in the engineering department shows a decided increase, due, no doubt, to the increased interest in technical work brought about by the war. The roll of students for the year was as follows:

Juniors	9
Sophomores	12
Freshmen	58
Specials	2
Part course	13
Total	94

The charter of Howard University calls for courses in agriculture, but it is only with the coming year that full courses will be offered. Greenhouses and necessary buildings are now in process of erection. A four-years' plan of study leading to the degree of B. S. in agriculture has been voted by the trustees.

THE CONSERVATORY OF MUSIC.

This department increases in prestige and power each year. The university chorus gave two great works during the year—"The Messiah" and "Hiawatha." The total number of students for the year

is 198. This is the largest enrollment ever presented. They were divided as follows: History of music, 3; harmony, 22; solfeggio, 25; counterpoint, 1; violin, 13; piano, 95; organ, 10; voice, 29.

THE LIBRARY SCHOOL.

This school is placed under the department of general service. Until we have recovered from the effects of the war, no regular instruction can be given to classes.

THE ACADEMY.

The work of the academy was pursued during the year with marked zeal and energy. The same high standards of former years were maintained. Accuracy and thoroughness in the performance of all duties have been uniformly insisted upon, and efforts have been made constantly to develop habits of regular and sustained study.

With the end of the current school year, the academy will close its doors. This action of the trustees of Howard University is designed to make it possible for the university to enter at once upon the great work and career intended by its founders. This action in discontinuing the academy does not mean that the university will have no further interest in secondary education, but, on the other hand, means that the university, conscious of the needs of the schools doing this work, is formulating plans to stimulate and raise the standards of the colored high schools and other institutions throughout the southland.

There were enrolled in the academy during the year 1918–19 the following:

Seniors	35
Middlers	42
Sub-middlers	53
Juniors	35
Unclassified	32
Total	197

THE COMMERCIAL COLLEGE.

The purposes of the commercial college have been well exemplified by the large number of students and graduates who filled the various offices from the rank of sergeant to lieutenant in the United States Army. A larger number of female students entered the department this year. Many students who were registered in the other departments of the university took subjects in the commercial college and found employment.

The roll of students for the year was as follows:

Fourth year	4
Third year	26
Second year	12
First year	11
Unclassified	31
S. A. T. C. Unit	9
Total	93

This school, lifted to college grade, will in the future be known as the School of Commerce and Finance.

WAR WORK.

A history of the part Howard University played in the war has been published by the university. It is a history of remarkable effort and achievement. Hundreds of colored officers proved their own fitness and brought glory to their race, because the activities of Howard men made possible the training camp at Des Moines.

In all, 1,786 men were trained at the university:

National Army	520
Training Camp for Officers (Instruction Camp)	457
S. A. T. C., Section A	388
S. A. T. C., Section B	421
Total	1,786

REORGANIZATION.

The academic plan of the university has been most carefully revised. All freshman students for next year will enter junior college. Two years' work will be demanded before the student may go to the senior school of his choice. Courses in the junior college will fit him to enter the two-year schools of journalism, liberal arts, education, and physical education, or he may go to graduate schools of law, medicine, or theology. The school of applied science demands its own full four years' course, while the courses in the school of music are taken in combination with the academic courses. Emphasis is laid upon the full four years' liberal arts course, but opportunity is given to specialize during the last two years, thus fitting the student to go at once to his life's task and at the same time have his college degree.

The discontinuance of all secondary work at the university gives opportunity for full emphasis upon regular college tasks.

REPORT OF THE TREASURER.

The financial statement for the year 1918–19 is appended. The auditing of all our accounts has been done by chartered accountants.

The expenditure of all money appropriated for our use by Congress takes place under the rigid supervision of the Department of the Interior.

J. STANLEY DURKEE, *President.*

FINANCIAL REPORT.

Expenditure of appropriation for maintenance, fiscal year ended June 30, 1919.

Administration:		
President, in part	$4,500.00	
Secretary, dean of commercial college and professor in part	1,875.00	
Treasurer, registrar, and professor of economics and political science, in part	1,875.00	
		$8,250.00
College of arts and sciences:		
Dean and professor of mathematics, in part	1,692.00	
One professor of biology, in part	1,593.00	
One professor of history, in part	1,770.00	
One professor of English, in part	1,416.00	
One professor of Latin, in part	1,593.00	
One professor of chemistry, in part	1,270.00	
One professor of physics, in part	1,416.00	
One professor of Greek, in part	450.00	
One instructor in French, in part	1,345.50	
One associate professor of mathematics, in part	1,368.00	
One professor of zoology, in part	1,125.00	
One instructor in mathematics, in part	500.00	
One associate professor of chemistry, in part	976.00	
One instructor in botany, in part	156.67	
One assistant professor of English, in part	1,350.00	
One instructor in chemistry, in part	1,245.00	
One instructor in English, in part	740.00	
One instructor in French, in part	500.00	
		20,506.17
Teachers' college:		
Dean and professor of pedagogy, in part	188.00	
One associate professor of mathematics, in part	1,548.00	
One professor of psychology, in part	1,620.00	
One associate professor of practice teaching, in part	1,413.00	
One professor of nature study, in part	910.00	
One instructor in teaching history, in part	784.00	
One associate professor of teaching English, in part	1,098,00	
One associate professor of history, in part	1,120.50	
		8,681.50
Academy:		
One dean and associate professor of mathematics, in part	1,782.00	
One professor of ancient languages, in part	1,376.00	
One instructor in English, in part	976.00	
One instructor in English, in part	208.53	
One instructor in English, in part	410.00	
One associate professor of ancient languages, in part	1,143.00	

Academy—Continued.		
One instructor in Latin, in part	$783.00	
One acting instructor in mathematics, in part	560.00	
One instructor in chemistry and physics, in part	1,134.00	
		$8,372.53
Commercial college:		
One instructor in bookkeeping, in part	1,008.00	
One instructor in finance and typewriting, in part	1,270.00	
One instructor in shorthand, in part	1,020.00	
One acting instructor in English, in part	560.00	
One instructor in bookkeeping, in part	819.00	
		4,677.00
Conservatory of music:		
One director and professor of singing, in part	1,458.00	
One instructor of piano, in part	810.00	
One instructor in piano, in part	918.00	
One instructor in piano, in part	750.00	
		3,936.00
Library:		
One librarian, in part	1,880.00	
One assistant librarian, in part	920.00	
One cataloguer, in part	620.00	
One assistant librarian, in part	670.00	
		4,090.00
One instructor in physical training, in part	164.00	
Bookkeeper, in part	880.28	
One clerk, in part	600.00	
One clerk, in part	578.50	
One telephone operator, in part	700.00	
One assistant to the secretary, in part	436.66	
One preceptress, in part	870.00	
One secretary to the president, in part	1,080.00	
One cashier, in part	562.50	
One assistant preceptress, in part	200.00	
One assistant preceptress, in part	369.00	
One resident head of Clark Hall, in part	120.00	
		6,560.94
School of law:		
Dean and lecturer on constitutional law, in part	1,165.62	
One lecturer on jurisprudence, in part	750.00	
One lecturer on torts, crimes, etc., in part	1,500.00	
One lecturer on contracts, in part	150.00	
One lecturer on evidence, etc., in part	1,500.00	
One lecturer on real property, in part	900.00	
One lecturer on partnership, in part	900.00	
One instructor in contracts, "case system," in part	150.00	
One lecturer on negotiable instruments, in part	250.00	
		7,265.62
Total salaries		72,339.76
Stationery		97.99
Total		72,437.75

Expenditure of appropriation for manual arts and applied sciences.

One director and instructor in civil engineering	$2,000.00	
One instructor in chemistry, in part	183.00	
One instructor in electrical engineering, in part	600.00	
One instructor in printing	1,100.00	
One instructor in domestic science	1,300.00	
One instructor in domestic arts, in part	1,008.00	
One professor of the biological sciences, in part	860.00	
One instructor in woodworking and drawing	840.00	
One clerk	111.48	
One clerk	420.00	
Janitors and laborers	463.27	
		$8,885.75
Equipment		8,454.91
Supplies, etc		2,659.34
Total		20,000.00

Expenditure of appropriation for natural-history studies and laboratories.

Chemical laboratory	$877.96
Biological laboratory	284.39
Physics laboratory	305.51
Nature-study laboratory	214.15
Academy physics and chemistry laboratory	317.99
Total	2,000.00

Expenditure of appropriation for repairs of buildings and improvement of grounds.

Repairs to buildings	$8,012.82
Improvement of grounds	1,987.18
Total	10,000.00

Expenditure of appropriation for libraries.

Academic library books, etc	$1,133.50
Law library books, etc	366.50
Total	1,500.00

Expenditure of appropriation for fuel and light.

Fuel and labor, central heating plant	$4,602.50
Other fuel	397.50
Total	5,000.00

Expenditure of appropriation for school of medicine.

Equipment and apparatus	$2,857.72
Laboratory supplies	2,038.77
Repairs to laboratories and buildings	2,103.51
Total	7,000.00

Distribution of expenditures from Government appropriations.

Appropriations.	Amount.	Expenditures.	
		Current fund.	Permanent-plant fund.
Disbursed through chief clerk of Interior Department:			
Maintenance salaries, etc	$72,437.75		
Salaries		$72,339.76	
Stationery		97.99	
Department of manual arts, apparatus and material	20,000.00	11,545.09	$8,454.91
Libraries, equipment, books, etc	1,500.00		
Law		110.00	256.50
Academic		284.40	849.10
Improvement of grounds and repairs of buildings	10,000.00	10,000.00	
School of medicine, repairs to laboratory, supplies and equipment	7,000.00	4,142.28	2,857.72
Laboratories, material and apparatus	2,000.00	1,493.86	506.14
Fuel and light	5,000.00	5,000.00	
Total credited permanent-fund account			12,924.37
Total credited current fund		105,013.38	105,013.38
Total appropriations	117,937.75		117,937.75

Balance sheet as at June 30, 1919.

ASSETS.

Current assets:			
Cash in bank and on hand		$11,995.09	
Students' debit balances	$10,865.96		
Less reserve	2,858.78		
		8,007.18	
Accounts receivable		1,569.73	
Notes receivable		481.00	
Supplies on hand		3,307.57	
Sundry investments		2,416.48	
Total current assets			$27,777.05
Deferred assets:			
Unexpired insurance			2,404.04
Educational plant:			
Land at June 30, 1919		616,057.47	
Buildings at June 30, 1918	619,857.52		
Additions during year	4,504.00		
		624,361.52	
Equipment at June 30, 1918	164,251.79		
Additions during year	10,610.68		
	174,862.47		
Less sale of typewriters	229.00		
		174,633.47	
Total educational plant			1,415,052.46
Investment of trust funds:			
Productive real-estate mortgages and other securities		310,402.14	
Unproductive land		93,187.08	
Cash in bank		2,213.29	
			405,802.51
Total assets			1,851,036.06

LIABILITIES AND FUNDS.

Current liabilities:			
Accounts payable		$6,215.87	
Note receivable discounted		300.00	
Students' credit balances		659.31	
Total current liabilities			$7,175.18
General capital funds:			
Current surplus—			
The general surplus	$4,673.03		
The medical school surplus	8,416.93		
		13,089.96	
Unexpended balances—			
Special funds	5,074.35		
Insurance collected on account of fire in main building	4,841.60		
		9,915.95	
Plant capital		1,415,052.46	
Total general capital funds			1,438,058.37
Trust funds:			
Permanent endowment funds		310,402.14	
Land fund (unrestricted)		95,400.37	
Total trust funds			405,802.51
Total liabilities and funds			1,851,036.06

General summary of income and expenditure for the year ended June 30, 1919.

EXPENDITURE.

Instruction:		
College of arts and sciences, teachers' college, commercial college, and academy	$63,067.72	
Academic laboratories	3,362.52	
School of theology	9,192.34	
School of law	9,840.45	
School of medicine	42,031.05	
Conservatory of music	6,683.84	
School of manual arts and applied sciences	12,785.98	
Library	6,978.64	
		$153,942.54
Net cost of dining hall		5,745.19
Maintenance		14,732.90
Administration		24,542.68
Students' aid		2,214.11
Miscellaneous		2,684.89
Total current expenditure		203,862.31
Improvements and addition to plant		15,114.68
Total expenditure		218,976.99
Special funds, unexpended balances		1,597.02
		220,574.01

INCOME.

From students—fees		$61,708.71
From endowment—rents and interest		16,978.47
From public funds—Federal Government appropriation		117,937.75
From donations—various donors		5,103.00
From other sources:		
Surplus on dormitories	$5,989.69	
Students' army training corps fees	4,822.13	
Sundries	6,679.91	
		17,491.73
Total income		219,219.66
Excess of expenditure over income for the year:		
General fund	474.63	
Medical school	879.72	
		1,354.35
		$220,574.01

SUMMARY OF ALL INCOME AND EXPENDITURE.

Expenditure as above		$218,976.99
Additional expenditure:		
Boarding hall	$23,998.30	
Dormitories	6,863.44	
Athletic	3,214.46	
		34,076.20
Total expenditure for all purposes		253,053.19
Income as above		219,219.66
Additional income:		
Boarding hall	23,998.30	
Dormitories	6,863.44	
Athletic	3,214.46	
		34,076.20
Total income for all purposes		253,295.86

Income and expenditure for year ended June 30, 1919.

INCOME.

Tuition and other fees:		
Academic departments	$14,598.86	
Academic laboratories	1,618.10	
School of theology	464.08	
School of law	2,613.13	
School of medicine	33,679.11	
Conservatory of music	4,905.37	
School of manual arts and sciences	1,220.04	
Library	1,484.06	
Gymnasium	1,125.96	
		$61,708.71
Students' Army Training Corps:		
For incidental fees	3,037.80	
Manual arts fees	634.80	
Laboratory fees	480.69	
Library fees	403.88	
Gymnasium fees	264.96	
		4,822.13

Income from endowment:		
For academic departments	$168.11	
School of theology	3,350.89	
School of medicine	1,068.09	
Library	21.25	
Students' aid	3,546.53	
Special purposes	178.29	
General purposes	8,655.88	
Students' debate	9.43	
		$16,978.47
Federal Government appropriation:		
For laboratories	2,000.00	
School of law	7,265.62	
School of medicine	7,000.00	
School of manual arts and applied science	20,000.00	
Library	4,374.40	
General purposes	77,297.73	
		117,937.75
Donations:		
For school of theology	1,294.25	
Students' aid	383.75	
Special purposes	3,400.00	
General purposes	25.00	
		5,103.00
From other sources:		
United States Government—rent credited to maintenance and department of manual arts and science	3,550.00	
Receipts from dental infirmary (gross)	1,993.14	
Interest and rents	789.26	
Miscellaneous receipts	347.51	
		6,679.91
Dormitories:		
Salaries and wages	3,588.86	
Heat and light	1,235.37	
Repairs and renewals	1,540.29	
Other expenses	498.92	
	6,863.44	
Deduct—faculty and students' rents	12,853.13	
Net surplus		5,989.69
Total income		219,219.66

(a) *Expenditures for current purposes.*

Academic departments:		
Salaries of instructors	$59,107.72	
Janitors' wages	1,630.27	
Commencement expenses	1,186.18	
Chapel expenses	750.42	
Other expenses	393.13	
		$63,067.72
Academic laboratories, supplies:		
Chemistry	1,327.88	
Physics	470.68	
Biology	596.36	
Chemistry and physics (academy)	485.59	

Academic laboratories, supplies—Continued.		
Nature study	$307.66	
Zoology	154.35	
Biology (academy)	20.00	
		$3,362.52
School of theology:		
Salaries of instructors	8,436.27	
Traveling and other expenses	756.07	
		9,192.34
School of law:		
Salaries of instructors, librarian, and clerks	9,070.00	
Repairs	91.80	
Heat, light, cleaning, and other expenses	878.65	
	10,040.45	
Deduct—rent of office	200.00	
		9,840.45
School of medicine:		
Salaries of instructors	32,012.00	
Laboratory supplies	3,675.89	
Repairs and renewals	2,103.51	
Other expenses	4,239.65	
		42,031.05
Conservatory of music:		
Salaries of instructors	4,955.30	
Heat, light, cleaning, and other expenses	1,563.35	
Repairs	165.19	
		6,683.84
School of manual arts and applied science:		
Salaries of instructors and students' labor	9,373.29	
Supplies	5,026.21	
Heat, light, cleaning, and other expenses	728.09	
	15,127.59	
Deduct—printing office income (gross)	2,341.61	
		12,785.98
Library:		
Salaries of librarians	4,753.65	
Heat, light, and cleaning	953.70	
Repairs	899.45	
Periodicals	242.12	
Other expenses	129.72	
		6,978.64
Dining hall:		
Salaries and wages	4,792.73	
Supplies	24,492.36	
Heat and light	286.24	
Repairs, renewals, and other expenses	172.16	
	29,743.49	
Deduct—charges to students	23,998.30	
		5,745.19
Maintenance:		
Salaries and wages	1,221.84	
Heat, light, and power	2,124.74	
Repairs to buildings	8,197.39	
Care and improvement of grounds	2,406.21	
Insurance	599.46	
Miscellaneous	183.26	
		14,732.90

Administration:		
Salaries and wages	$17,465.88	
Printing, stationery, and postage	1,788.02	
Publications	1,828.60	
Advertising	1,668.07	
Telephone and telegrams	439.76	
Traveling expenses	517.30	
Miscellaneous	835.05	
		$24,542.63
Students' aid:		
Scholarships and gratuities (net)		2,214.11
Miscellaneous:		
University record	1,015.61	
Military garments for young women	650.96	
Y. M. C. A.	92.25	
Gymnasium	366.80	
Glee club	257.98	
Sundries	301.29	
		2,684.89

(b) *Expenditure for improvements.*

Buildings:		
Lumber shed	$200.00	
Greenhouse	4,304.00	
		$4,504.00
Equipment:		
Laboratories	630.15	
School of law	258.50	
School of medicine	2,742.86	
Department of music	619.00	
Department of manual arts and applied science	4,653.57	
Library books and equipment	1,193.09	
Administration	376.20	
Academic department	108.75	
Dormitories	28.56	
		10,610.68
Total expenditure for all purposes		218,976.99

Endowment funds, June 30, 1919, with income for the year ended June 30, 1919.

General, departmental, and sundry special endowment:	Principal.	Income.
School of medicine	$15,000.00	$750.00
Hartford reading room	425.00	21.25
Henry G. Maynard prize debate	560.00	28.00
Intercollegiate debating fund	88.50	4.43
Gregory prize debate	100.00	5.00
General endowment fund	160,444.92	9,040.51
	176,618.42	9,849.19

	Principal.	Income.
Professorships:		
Stone professorship of theology	$40,000.00	$2,036.44
Emily H. Moir theological professorship	23,900.00	1,175.00
Ewell theological professorship	1,000.00	50.90
School of theology alumni professorship	971.00	42.30
Thaddeus Stevens professorship	2,200.00	110.00
Grebel professorship	2,450.00	122.50
Whittier professorship	875.00	43.75
Alumni professorship	25.00	1.25
William W. Patton memorial professorship	12.10	.61
	71,433.10	3,582.75
Scholarship and student aid:		
Martha Spaulding aid	8,828.26	441.41
Frederick Douglass scholarship aid	8,503.11	425.16
Francis B. Schcals scholarship aid	6,000.00	300.00
William E. Dodge scholarship aid	5,000.00	250.00
John W. Alvord scholarship aid	4,000.00	224.35
Pomeroy scholarship	2,500.00	125.00
Mary B. Patton scholarship aid	1,200.00	60.00
Horace Ford scholarship aid	1,000.00	50.00
J. K. McLean scholarship aid	1,000.00	50.00
Orange Valley Church scholarship aid	1,000.00	50.00
William W. Patton scholarship aid	1,000.00	50.00
Thomas Cropper Riley scholarship aid	1,000.00	50.00
Lincoln memorial prize scholarship	700.00	35.00
Edward Smith textbook aid	500.00	25.00
J. P. Thompson scholarship aid	260.00	13.00
Caroline Patton Hatch student aid	200.00	10.00
Commercial (normal) department aid	147.93	7.04
General scholarship and student aid	19,511.32	1,380.57
	62,350.62	3,546.53
Total funds	310,402.14	16,978.47

REPORT OF THE SUPERINTENDENT OF THE UNITED STATES CAPITOL BUILDING AND GROUNDS

REPORT OF THE SUPERINTENDENT OF THE UNITED STATES CAPITOL BUILDING AND GROUNDS.

OFFICE OF THE SUPERINTENDENT
UNITED STATES CAPITOL BUILDING AND GROUNDS,
August 16, 1919.

SIR: I beg to submit herewith a report of the work carried out under this office for the fiscal year 1919:

SENATE WING.

In this section of the Capitol Building, important changes and improvements in the heating and ventilating system have been inaugurated, including the installing of two ventilating fans above the Senate cloakrooms and changes in the source of air handling and supply. These have made necessary the removal of the tank forming a part of the equipment of the old hydraulic elevator. New tanks have been supplied for the refrigerating system in the Senate kitchen, the cold-storage plant thoroughly overhauled, reequipped where necessary, and put in good condition; new worm shafts, motor switchboards, and hatchway limits installed on elevators Nos. 1 and 2; new worm-shaft bearings placed on elevators Nos. 3 and 4, the dumb-waiter repaired, new equipment provided. A new line of pipe has been installed for heating the coils of the west terrace, the north terrace, and the Senate subway.

During the intervals occurring between the close of the Sixty-fifth Congress and the Sixty-sixth Congress the time was largely employed in touching up and repainting in the different sections of the Capitol. In the Senate wing the walls of the Senate Chamber were touched up and the ceilings cleaned; the room of the Vice President touched up and restored; walls and woodwork of the Senate Committee on Immigration painted; ceilings cleaned and walls touched up in the rooms of the Senate Committee on Appropriations, the Senate Committee on Indian Affairs, and the room of the Joint Committee on Printing. The corridors of the Senate wing were cleaned and repaired where necessary, this work including partial restoration of the decorations of the basement corridors of the Senate wing. Six other office rooms occupied by Senators in the Senate wing have been repainted.

In addition to the painting work before referred to there should be included such work as painting walls of toilets, touching up and painting of the Senate restaurant, painting of the walls of lobbies, Senate Chamber, and Senate press gallery, and repairs to the doors leading into the Senate Chamber.

Electric-light equipment and repairs in the Senate wing include one fixture installed in Senate Committee on Commerce, five fixtures

in Senate press gallery, one fixture in room of Senate Committee on Printing, two fixtures in room of Committee on Foreign Affairs, and six other fixtures in office rooms occupied by Senators.

Miscellaneous repairs include the removal of a partition in the Senate Committee on Immigration; installation of a toilet in the minority room, a lavatory complete in the room of the Committee on Cuban Relations. The equipment of rooms in the Senate terrace with 35 pairs of iron grating doors and transoms has been completed.

HOUSE WING.

In the Chamber of the House of Representatives a cork tile floor has been laid in the area fronting the desk of the Speaker and in the center and outside aisles of the Chamber; the fireplaces in the lobbies repaired, the ceilings cleaned, the walls touched up, and the frames of the portraits of Washington and Lafayette regilded. Terazzo floors have been laid in the principal offices of the Clerk of the House of Representatives and a doorway cut to connect the adjacent rooms. From the file room a partition has been removed to form an additional anteroom for the House Committee on Appropriations. In the heating and ventilating department machinery has been overhauled and new parts supplied as needed. The general painting and touching up in this section of the Capitol includes restoration of ceilings and painting of walls and woodwork of the Committee on Appropriations; cleaning of ceiling and touching up of room of Committee on Accounts; painting the walls and woodwork of the room occupied by the bill clerk, the Clerk's office; the painting of all elevator shafts; touching up and cleaning ceilings of all corridors, the Press Gallery, the office of the Doorkeeper, one of the rooms of the House Library, the rooms of the House Committee on Foreign Affairs, woodwork in the House folding room, walls and woodwork in Committee on Indian Affairs, office of the Journal Clerk, ladies' retiring room, room occupied by the page boys, room of Committee on the Post Office and Post Roads, woodwork in the Speaker's room, House restaurant, Reform in the Civil Service, and room of the Committee on Railways and Canals. The walls and woodwork were painted or repaired in 8 office rooms in the House section of the center building.

Lavatories have been installed in rooms occupied by the Clerk of the House, the office of the Journal clerk, Committee on the Post Office and Post Roads, Joint Committee on Printing, and in three private office rooms; glass shelves and towel bars installed in room of Committee on Rules and the room of Committee on Foreign Affairs.

Electric-lighting equipment installed in the House wing comprises: Three ceiling fixtures in Clerk's office, 6 ceiling fixtures in the press gallery, 1 in the Committee on Rules, 8 in the Republican cloak room, 8 in the Democratic cloak room, 3 in the entrance to the Hall of the House, 3 in the House lobby, 9 in the House restaurant, 4 in the room of the Committee on Accounts, 4 in the room of the file and bill clerk, 5 in the disbursing office, 3 in room of Committee on Printing, 4 in room of Committee on Elections No. 2, 1 in room of pages, 1 in the room of Reform in the Civil Service; 10 one-light crystal-light brackets in room of the Committee

on Appropriations; 3 ceiling fixtures in room of Committee on Invalid Pensions, one in room of Committee on Expenditures in the War Department, and 6 in private office rooms. Fifteen emaralite desk lamps have been installed in various offices of the House wing.

MISCELLANEOUS REPAIRS.

During the fiscal year a large number of general minor repairs of a character difficult to describe or tabulate have been made. Daily inspections of the 11 elevators are required, as well as the constant care of all mechanical equipment, including that of the two restaurants. This inspection and care and the daily minor repairs are promptly attended to by the engineers and machinists in charge. The daily renewal of electric-light bulbs and attention to small ventilating fans is attended to by the electricians of the Capitol Building.

Exclusive of the items above referred to, 684 minor repairs have been attended to during the year.

WORKS OF ART IN THE CAPITOL.

Two accessions to the works of art have been received since my last report. The State of Florida has installed in Statuary Hall a bronze statue of Gen. E. Kirby Smith, by C. A. Pillars, and a portrait in oil of former Speaker Hon. Champ Clark, the work of Boris B. Gordon, has been added to the collection of portraits of former Speakers in the lobby adjoining the Hall of the House of Representatives.

UNITED STATES CAPITOL GROUNDS.

In addition to the general customary work on the Capitol Grounds, including the care of the lawns, walks, and drives, care of plant cases, trees, and shrubs, there have been planted 170 shrubs, 6 trees planted and 4 removed, 310 trees have been pruned of deadwood, dead cavities in 20 trees surgically treated, 475 cubic yards of compost used as top dressing on the lawns, and 1,775 square yards of sod placed.

Pointing and repairs have been made to the balustrades and piers of west front and the walls of the grand staircase and to the fountain and basin at the west front. At the east front the fountains and four granite lamp posts have been pointed and repaired.

Two of the motor lawn mowers have been completely overhauled and repaired.

CAPITOL POWER PLANT.

Continuous successful operation of the Capitol power plant has been maintained during the past fiscal year, and needed repairs and replacements necessary to keep the equipment in effective service have been attended to.

During a portion of the time current has been supplied to the new Interior Department Building, and with the concurrence of the House Office Building Commission current has been furnished to the group of buildings located between the Captiol Grounds and the Union Station and used as dormitories under the charge of the Housing Corporation.

ENGINE HOUSE, SENATE AND HOUSE STABLES.

For some months prior to January 1, 1919, the old No. 3 engine house was used, with the consent of the proper authorities, as a salvage station of the American Red Cross.

The roof on the Senate stables has been replaced with a new roof, the plumbing overhauled and repaired, and additional electric wiring installed.

All necessary repairs at the House stables have been properly attended to.

RECONSTRUCTION, UNITED STATES COURTHOUSE.

While the work at the courthouse is rapidly nearing completion and its occupancy by the courts expected at an early date, it is deemed best to defer a detailed description of the work accomplished and the accommodations thereby furnished until the building has been placed in possession of the courts. It may, however, be stated in a general way that the architectural features of the exterior have been preserved for the reason that it has always been considered one of the best examples of architectural beauty in the District of Columbia. The interior has been completed, remodeled to meet the demands of the present time, and contains all modern improvements. A statement of the cost of the building to date will be found in the financial statement.

COLUMBIA HOSPITAL FOR WOMEN AND LYING-IN ASYLUM.

Following the completion of this hospital, constructed under the supervision of this office, annual appropriations for the heating, lighting, and power used in this building, and for the repairs of the mechanical and scientific equipment, have been placed under the charge of the Superintendent of the United States Capitol Building and Grounds. During the fiscal year ended June 30, 1919, all needed repairs have been made to doors and windows, new shelving furnished for the storeroom, special equipment throughout the building has been overhauled and restored to effective conditions, the heating plant repaired, a high-pressure steam line installed to sterilizers and utility rooms, and the indirect heating system for the opearating and delivery rooms remodeled.

NEW WOMEN'S DORMITORY, COLUMBIA INSTITUTION FOR THE DEAF.

Although my report of last year announced the completion of the building proper there remained other work to be attended to which has been completed during the fiscal year just ended. This work, briefly summarized, includes the construction of a 15-foot concrete driveway around the building, the construction of a large unloading platform, and the connection of concrete sidewalks connecting the driveway with the various entrances to the building; the driveway is also connected with the Florida Avenue entrance to the grounds with a 12-foot macadamized roadway with stone curbs.

Work in the interior of the building comprises the installation of modern equipment for the gymnasium, the construction of lockers

and shelving for two linen rooms, the installation of glass shelves and towel racks in all of the rooms of the dormitories, the completion of the finishing and varnishing of woodwork in the basement and first floor, painting of all corridors and the entrance hall, necessary adjustment of all doors and windows, the covering of all steam pipes with asbestos pipe covering and the water pipes with thick wool-felt pipe covering.

UNITED STATES BOTANIC GARDEN.

Mr. George W. Hess, Superintendent, reports as follows:

During the winter a fire occurred in the boiler room of the seed department, resulting in considerable damage to the east end of the building; in repairing, iron construction was used. An additional stairway in the center of this building has been erected.

A room used as a ladies' toilet has been remodeled, a cement floor laid, walls replastered, and new plumbing installed.

A new sectional boiler has been installed on the Maryland avenue reservation.

Heating apparatus has been installed in greenhouse No. 7.

All necessary minor repairs have been made to the buildings and heating plants, 3,500 square feet of propagating benches installed, and water coolers or fountains placed throughout the grounds.

A motor-delivery truck, which gives satisfactory service, has been purchased at a price of $758.50.

ELLIOTT WOODS,
Superintendent U. S. Capitol Buildings and Grounds.

The SECRETARY OF THE INTERIOR.

APPENDIX.—EXPENDITURES.

Capitol Building and repairs, 1919.

Pay rolls and vouchers	$26,870.95
Office vehicle and maintenance	6,338.70
Machinery and ironwork	229.95
Brushes, sponges, soap	1,161.93
Lumber and millwork	1,639.03
Hardware	1,845.95
Lime, brick, cement, sand	72.33
Paint, oil, glass	3,009.43
Stone and marble work	83.88
Legislative bell service	195.05
Drawing, blue prints, etc	8.00
Repairs to ranges, etc	598.86
Hauling, telegrams, expressage	8.32
Plumbing material	583.39
Elevators and repairs	1,480.66
Roofing and tin work	401.19
Painting and decorating	158.58
Tile and tiling	761.13
Flags	145.00
Traveling expenses	65.80
Stationery and books	201.88
Repairs revolving doors	36.00
Heating and ventilating repairs	1,432.62
Reserved for unpaid bills	4,770.37
	52,000.00
Amount appropriated, sundry civil bill, approved July 1, 1919	52,000.00

Improving the Capitol Grounds, 1919.

Pay rolls and vouchers	$26,139.24
Plants and seeds	633.85
Fertilizers	200.00
Tools and machinery	103.88
Brushes, brooms, etc	460.50
Soil and sod	532.50
Motor and hand mowers	675.00
Cement, lime, etc	127.90
Plumbing materials	56.10
Hardware	104.09
Paving and repairs	383.47
Freight and express	3.97
Hose and couplings	55.00
Lumber	19.35
Trucks, carts, etc	2,216.65
Trees	140.00
Repairs, fountains	105.00
Reserved for unpaid bills	3,793.50
	35,750.00
Amount appropriated, sundry civil bill, approved July 1, 1918	35,750.00

Capitol power plant, 1919.

Pay rolls and vouchers	$85,194.62
Office supplies and expenses	20.00
Power-plant building	1,040.24
Miscellaneous power-plant equipment	1,780.83
Turbines and motor generators	1,369.49
Switchboards and equipment	990.50
Boilers and stokers	12,930.79
Coal and ash handling equipment	1,121.25
Miscellaneous steam equipment	69.97
Pumping station and waterway	391.73
Steam-transmission tunnel	613.07
Electric-transmission ducts, etc	15.45
Electric apparatus and accessories	252.24
Wire and material	4,694.35
Fixtures	22.08
Incandescent and arc lamps	9,498.65
Hauling, express, telegrams, etc	33.22
Gas and electric current	1,125.51
Fuel, oil, waste	127,867.36
Traveling expenses	272.93
Reserved for unpaid bills	671.38
	249,975.66
Amount appropriated, sundry civil bill approved July 1, 1919	238,000.00
Credit for current furnished Interior Department and Housing Corporation	11,975.66
	249,975.66

Engine house, Senate and House stables, 1919.

Pay rolls	$418.96
Lumber	4.77
Roof and tin work	538.11
Plumbing material	162.21
Reserved for unpaid bills	375.95
	1,500.00
Amount appropriated, sundry civil bill approved July 1, 1919	1,500.00

Senate kitchen and restaurant, 1919.

Pay rolls and vouchers	$28,342.04
Equipment	9,406.97
Cleaning material	514.78
Repairs to ranges, ovens, etc	595.20
Expressage	1.86
Reserved for unpaid bills	2,139.15
	41,000.00
Amount appropriated sundry civil bill approved July 1, 1918	41,000.00

RECONSTRUCTION OF COURTHOUSE, WASHINGTON, D. C.

Statement of appropriations, expenditures, etc., to June 30, 1919.

Amount appropriated:	
Sundry civil bill, approved July 1, 1916	$200,000.00
Deficiency bill, approved September 8, 1916	150,000.00
Deficiency bill, approved July 8, 1918	445,000.00
	795,000.00

Expenditures:		
Excavation	$4,652.67	
Concrete footings and foundations	12,338.30	
Rough brickwork	79,299.98	
Exterior stonework, stucco and main steps	113,690.10	
Interior stonework	22,768.73	
Steel framing for floors, roof, etc.	29,401.95	
Fireproofing floor construction, concrete, etc	29,719.42	
Terra cotta partitions	5,126.21	
Roof construction and skylights	22,582.12	
Miscellaneous ironwork and stair construction	16,948.35	
Elevators and inclosures	11,187.50	
Steam heating	18,338.86	
Plumbing, sewer work, etc	34,116.99	
Ventilation	6,522.13	
Plastering and grounds	72,103.81	
Ornamental plastering	928.50	
Windows, doors, jambs, etc., millwork	90,172.45	
Glass and glazing	4,509.70	
Finished flooring, cork and terrazzo	8,262.69	
Electrical work and chandeliers	20,761.30	
Painting	14,887.56	
Furnishings	1,112.00	
Architects and engineers	15,041.00	
Drafting material	1,280.82	
Office force, foremen, constructors, timekeepers, watchmen, etc.	19,603.35	
Traveling expenses	345.59	
Advertising and printing	89.64	
Technical books and instruments	101.56	
Telegraph, telephone, hauling	363.68	
Contingent	3,192.99	
Fence, storehouse, sheds, tools, etc	325.64	
Preliminary, wrecking, demolition, etc	38,843.77	
Reserved for contracts, etc	96,380.64	
		$795,000.00

NEW WOMEN'S DORMITORY, COLUMBIA INSTITUTION FOR DEAF.

Statement of appropriations, expenditures, and balances reserved June 30, 1919.

Excavation	$3,072.98
Concrete footings and foundations, including waterproofing	5,012.98
Rough brickwork, including waterproofing	18,720.90
Exterior stonework	3,453.15
Interior stonework and marble	7,135.00
Steel framing for floors, roof, etc	15,507.52
Expanded metal	96.44
Concrete floors, floor arches, waterproofing	7,567.14
Terra cotta partitions, etc	10,251.10
Roof covering and skylights	6,970.85
Iron stairways	4,499.65
Steam heating	7,154.54
Plumbing, standpipes, etc., pool	16,132.90
Ventilation	1.59
Plastering and grounds	9,439.26
Exterior millwork, windows, doors, etc	3,976.46
Interior millwork, windows, doors, etc	16,217.30
Glass and glazing	764.00
Finished flooring—linoleum	4,496.10
Electrical work and chandeliers	4,588.57
Painting	3,035.00
Furniture, blackboards, gymnasium equipment	6,416.16
Court, curb, parking, drives, and walks	3,851.26
Architects and engineers	6,125.00
Draftsmen and assistants	100.00

Drafting material and blue prints	$112.67
Office force, constructors, foremen, timekeepers, watchmen, etc	9,923.14
Traveling expenses	23.21
Advertising and printing	15.65
Technical books and instruments	262.00
Telegraph, telephone, hauling	557.08
Contingent	404.67
Storehouse, tools, constructor's office, fence	1,234.70
Temporary quarters	2,990.48
Preliminary: Wrecking old building, etc	2,328.38
Reserved for balance due on contracts	62.26
	182,500.00

Amount appropriated:	
Sundry civil bill, approved July 1, 1916	90,000.00
General deficiency, approved September 8, 1916	53,000.00
Urgent deficiency, approved October 6, 1917	21,000.00
Urgent deficiency, approved March 28, 1918	18,500.00
	182,500.00

REPORT OF THE DIRECTOR OF THE NATIONAL PARK SERVICE

ANNUAL REPORT OF THE DIRECTOR OF THE NATIONAL PARK SERVICE.

DEPARTMENT OF THE INTERIOR,
NATIONAL PARK SERVICE,
Washington, October 15, 1919.

SIR: In submitting this third annual report of the National Park Service, which covers the tourist season that has just come to an end, and the fiscal affairs of the bureau for the year ended June 30 last, I am more than pleased to advise you that in every branch of our activities successful results, directly beneficial to the national parks, have been obtained.

On the other hand, legislation enacted during the year has added two new national parks of great distinction to the system, and has opened new avenues of development that will make our future administrative efforts more effective. Other legislation which failed of enactment, on account of the accumulation of business at the close of the last Congress, passed either the Senate or the House of Representatives unanimously, thus indicating a generally favorable sentiment toward meritorious national-park measures.

However, quite aside from our administration, protection, and improvement of the parks and the extension and advancement of the system by Congress, the enormous use of these great playgrounds is worthy of first consideration because this is the factor that determines the success or failure of what the Government is doing for and with the national parks. Never before has there been such travel in America, and never before have so many people toured the parks.

Released from the strain of war activities, and freed from the power of sentiment against vacation touring, there was a general desire to move about the country for recreation, for amusement, in search of new business opportunities, and oftentimes simply to get a change of scene. It was this overwhelming ambition to get far from the activities of the previous two years that prompted thousands to go from coast to coast and through many national parks in their automobiles, using hotels as they traveled, or, as was very often the case, taking their own equipment and supplies and camping along the highways.

Likewise, other thousands sought the service of the trains to take them away to new scenes and they came to the national parks from every corner of the United States. Travelers from abroad put in appearance once more, and all combined to make this the greatest travel season in the history of the Nation.

BUREAU OF SERVICE HELPS.

The attitude of the United States Railroad Administration toward travel influenced profoundly the general interest in making extensive trips. By sharp contrast with its firm policy of discouraging travel during the war, it took the opposite stand soon after the cessation of hostilities, with the result that winter resorts of the South and West enjoyed extremely heavy patronage. Continuing this policy, the administration, through its passenger traffic committees, authorized extensive advertising of the summer resorts of the country, with special emphasis on the national parks, because they were public possessions and under the control of the Government. The promotion of park travel, of course, fell naturally to the western committee and the bureau of service, national parks and monuments, with headquarters in Chicago.

This service bureau had been created nearly a year before for the purpose of coordinating the distribution of park-travel information, advising ticket agents regarding ways and means of reaching the parks, and forming the point of contact between the National Park Service and its business interests on the one hand and the Railroad Administration on the other. The war had prevented the achievement of most of the results desired, but this bureau was well organized and prepared to perform its functions when changed conditions made the resumption of travel promotion advisable.

It planned a series of national-park booklets, which were prepared and published in cooperation with a committee on advertising under the supervision of the western passenger committee. Differing from the usual railroad folder in shape, and vastly more attractive, this series of booklets on the national parks became at once the most powerful inducement to travel in the parks that had appeared since the publication of the National Parks Portfolio some three years ago, and was more effective than the portfolio because issued earlier in the season than the older series. Not only did the beautiful series of railroad booklets greatly increase train travel to the national parks, but it very appreciably influenced automobile travel.

I dwell upon the beauty and effectiveness of these booklets because I am in a position to appraise their value and likewise the work of the Bureau of Service in distributing them with the other travel data throughout the length and breadth of the land. I think this bureau should be one of the institutions of the Railroad Administration to survive the return of the lines to private operation. I think the series of national-park publications—as well illustrated and as well written as any railroad publication issued in recent years—might be reissued each year for distribution by the bureau and by the National Park Service, because we can and do use this series with great effectiveness.

A NATIONAL TRAVEL BUREAU.

With a coordinated railroad travel bureau and a division of the National Park Service charged solely with the encouragement of American travel by rail and automobile working together and in harmony with all other agencies interested in the promotion of touring

in this country, we will be able to meet the competition of Europe from the beginning of its renewed activity.

I can not too strongly recommend the establishment of a travel division in the National Park Service. It is vitally important to the Nation, and our bureau is certainly the place for it, because no other agency of the Government is so interested in or closely connected with the touring public as is this Service.

A division of touring could cooperate closely with the resorts of the Nation, whether in a national park or not, and by issuing promotive literature under the stamp of the approval of the department and the Service could more effectively stimulate travel in the United States than any other agency, because its data would not be selfish or exaggerated and would have the confidence of everybody using it. This is the type of literature that several foreign countries use, and it is distributed through governmental or semiofficial offices.

Another reason for the establishment of a touring division is to be found in the fact that the National Park Service is not equipped to adequately furnish the information that is now requested of it. Last spring inquiries were received at the rate of several hundred a day, and although two additional clerks were secured from the department to assist in answering the vast number of requests for travel data, it was impossible to keep abreast of the incoming tide of mail.

COMPETITION OF EUROPE.

To say that European nations will seek to recover their American tourist business is to state a self-evident fact. One of their greatest and most profitable prewar sources of income was the throng of tourists that yearly crossed the ocean from America. It is but natural that they should seek to rebuild this business among their first efforts at reconstruction of their shattered fortunes. Also it is to be expected that Americans will travel in Europe again as soon as facilities are available for their accommodation and entertainment. The nations that have a tourist business to rebuild will undoubtedly operate official advertising bureaus for the encouragement of American travel. Some of them are engaged in such promotion work now, and are already obtaining results. All this is to be expected, but should not America, through her Government, take similar official steps to encourage touring here? Certainly this seems the course to pursue.

Protection of the dyestuff industry of the United States will come as a matter of course, aid to our potash producers will doubtless be granted, and similar assistance will be given to other industrial organizations; but what protection will the great resorts of this country have from the greatest campaign for tourist travel in foreign lands that will ever have been waged? There is only one kind of aid that can be offered to these enterprises and that is active promotion of all travel in America by the Government through an agency such as this Service; it, in turn, working in cooperation with the railroads, the automobile associations, highway associations, mountaineering clubs, travel organizations, etc. The establishment of such an agency is a present national necessity.

PUBLICATIONS OF THE PARK SERVICE.

We have not been able to issue any entirely new literature regarding touring in the national parks, but the circulars of information for all of the parks were corrected, and issued in considerably increased editions. An illustrated cover of high-grade coated paper was used for the first time and made these circulars quite attractive, and probably induced many people to keep them. These booklets were distributed by the Service, by the park superintendents, and by the Bureau of Service, National Parks and Monuments, of the Railroad Administration, and to a limited extent by commercial clubs and highway associations of the Western States.

"Mountaineering in Rocky Mountain National Park," by Superintendent Roger W. Toll, of Mount Rainier Park, was issued prior to the opening of the season. It is a valuable manual for mountain climbers in Rocky Mountain Park and has been eagerly received by the outdoor clubs and individuals interested in the sport it champions and helps. It is a sale publication, under the control of the Superintendent of Documents.

"Wild Animals of Glacier National Park," by Vernon Bailey and Florence Merriam Bailey, which I described in last year's report, also came from the printer early in the current year, and the first edition is already exhausted.

A new edition of the popular pamphlet, "Glimpses of Our National Parks," is in the hands of the Government Printing Office and will be ready for general distribution next spring. Another pamphlet, entitled "Glimpses of Our National Monuments," is in course of preparation and will probably appear early next season.

Popular publications on the wild life of Mount Rainier National Park and the flora of Glacier National Park are to be issued during the winter months. Data for these books were gathered in the parks in August and September.

As usual, we published large editions of automobile maps, which were widely distributed, free of charge.

PICTURE SERVICE.

The stock of motion-picture films, lantern slides, and other pictorial material belonging to the Service was considerably used during the year, but was not in so much demand as it was prior to the war. The material, on the other hand, is in need of repair and reclassification. Much good motion-picture film should be edited. All of this work requires time that could not be afforded during the past year.

Meantime there has been a larger demand than ever before for permission to make motion pictures in the national parks. Permits covering this work in the parks require the delivery of one positive print of all film finally selected for use to the National Park Service. Thus the prospects of largely augmenting our film stocks are bright.

The traveling exhibits of national-park pictures, mentioned in last year's report, is still in great demand and is being constantly exhibited in public libraries. More of these exhibits would be powerful factors in promoting national-park tours, and as soon as the

Washington office of the Service is provided with money for material of this kind, it will be secured in large quantities.

EXHIBITS OF NATIONAL-PARK PICTURES.

In February I conducted, at the Cosmos Club in Washington, D. C., a photographic exhibit of winter scenes in the national parks. This display attracted a very large attendance of official and private citizens of Washington and other cities. The parks represented were Mount Rainier, Yosemite, Yellowstone, Sequoia, Grand Canyon, and Rocky Mountain, and included some of the finest works of such well-known photographers as Asahel Curtis, Herbert W. Gleason, J. E. Haynes, Rodney Glisan, Lindley Eddy, and the Wiswall brothers.

In the exhibition of the activities of the Interior Department, held in May, a comprehensive display of park pictures was the chief representation of this bureau.

A STUDY OF THE PARK TRAVEL.

Having covered the range of our activities in the promotion of travel and the furnishing of information, and having discussed the effective work of the railroads and other agencies in stimulating interest in the national parks, it is well to revert to a further survey of the season's travel.

The most significant data to consider are the total travel figures for the past three years; 1917, the best season prior to that of this year; 1918, the war year, which saw decreased travel in nearly all the parks; and 1919, by a considerable margin the most satisfactory season in the history of the park system. These figures follow:

Year.	Number of visitors.
1917	488,268
1918	451,691
1919	755,325

Expressing this in the striking terms of percentage, travel in 1919 increased 54 per cent over that of the previous record year and 67 per cent over the war season of last year.

Now let us consider the increase in motor travel to the national parks, which is more astounding than the total increase. The following figures tell the story:

Year.	Number of private cars.
1917	54,692
1918	53,966
1919	97,721

The increase in the number of cars is 78 per cent over the number that entered the parks in 1917. While the numbers of motorists entering in these cars might not bear the same relation to each other, nevertheless, in the absence of exact data on the number of tourists visiting the parks each season, we may safely assume that they have increased this year 75 per cent over the number of motorists that toured the park system in 1917.

In Yellowstone National Park, where a very accurate record is kept of each class of travel, the statistics of private motor travel

prove the reliability of these percentages. The following table shows this clearly:

Year.	Number of private cars.	Number of motorists.
1917	5,703	21,268
1918	4,734	17,317
1919	10,737	39,886

TRAVELERS COME FROM EVERY STATE.

Just as the rail lines brought people to the parks from every State in the Union and from several foreign countries, so the motorists came in their own cars from every corner of the country and from Canada and Mexico, traveling on the great transcontinental highways until they reached the approach roads to the national parks where they used what will be the park-to-park highway. Some motorists visited all of the national parks, and many others toured from two to four or five.

More than half carried their own supplies and camp equipment and enjoyed their playgrounds in their own way. As they went from their own homes to the parks or between these reservations, they found in almost every town a well-kept automobile camp which they were privileged to use free of charge. Many of these camps are rather elaborately equipped with electric or gas stoves and ample water supplies. Wood is nearly always made available. Of course small charges are made in some places to cover the cost of wood or other fuel.

The evolution of the automobile camp has been a source of great interest to me. I have seen it grow year by year from a modest space in a park of a thriving western city to large and bountifully supplied camps in hundreds of towns and cities. It is now an institution of the West and particularly of the park-to-park highway.

CONVENTIONS IN THE PARKS.

There has been considerable use of the parks for conventions this year, and in some cases these gatherings have caused such overcrowding of hotel and camp facilities that more or less inconvenience and discomfort resulted. It is doubtful whether the holding of conventions in the parks can be generally encouraged again until such time as most of the hotel and camp facilities are extended.

Among the large conventions held in the parks were those of the Montana Bankers' Association in Yellowstone Park; the Washington Bankers' Association, the West Coast Lumbermen's Association, the Association of Western Confectioners, the Knights of Pythias, and Order of the Eastern Star, in Mount Rainier; and the Native Sons of the Golden West, in Yosemite.

INTERPARK TRAIN PARTIES.

Another unusual feature of the season's travel was the number of large parties that traveled between the parks by train. I have no means of knowing just how many such parties toured all or part of

the park system, but several have been reported to the Service in the course of the summer, among them the Travel Club of America party and the Massachusetts Forestry Association which visited Rocky Mountain, Yellowstone, Glacier, Mount Rainier, Crater Lake, Yosemite, and Grand Canyon National Parks. The unique and interesting trip of the Brooklyn Eagle party is described elsewhere in this report. It visited Rocky Mountain, Yellowstone, Glacier, and Mount Rainier National Parks and two parks of the Canadian system.

The National Editorial Association, nearly 400 strong, visited Crater Lake and Mount Rainier National Parks and some of the Canadian parks.

THE PARK-TO-PARK HIGHWAY.

The prospects for the establishment of the national park-to-park highway as a great system of interstate routes in the West have grown brighter almost daily since the opening of the past touring season. The immense value of such a system has come to be appreciated more this year than ever before. There is now a wide demand for the highway, where prior to this year its importance was seen by relatively few communities, most of which were on direct routes to the national parks, and had unusual opportunities to observe its growing volume of motor travel.

The unprecedented travel of the season just closed, however, demonstrated to cities and towns far distant from the national parks that these great playgrounds were the most powerful magnets for motoring tourists that the western country possessed, and that if this travel was to continue and grow in volume roads to and between the national parks must be made the object of special attention by the various States and all of their local subdivisions.

BROOKLYN EAGLE AND OTHER INTERPARK TOURS.

Another reason for the unusual interest that is being taken in the park-to-park highway plans is found in the operation of special transportation service between certain parks during the past summer. The Yellowstone Park Transportation Co. and the Glacier Park Transportation Co. cooperated in the operation of an automobile line between Yellowstone and Glacier National Parks, making an overnight stop in Helena. The maintenance of this service naturally attracted attention to the feasibility of making the trip between the two parks and many private cars followed the automobile stages. Likewise an attempt to maintain service between Denver, Rocky Mountain Park, and Yellowstone Park by the owners of the transportation lines of these two parks by way of Cheyenne, Casper, Thermopolis, and Cody, Wyo., stimulated extraordinary interest in that section of the interpark highway.

The first extensive park-to-park trip to be made utilizing the facilities of this interpark motor service was taken in July and early August by a party organized by and under the guidance of the Brooklyn Daily Eagle. This party traveled in a special train to Denver, where it transferred to cars of the Rocky Mountain Parks

Transportation Co. for a tour of the Rocky Mountain National Park. Thence in national park cars it proceeded to Cheyenne where it attended the Frontier's Day celebration on July 25. Later a portion of the party motored across Wyoming, through Yellowstone Park, and thence to Glacier National Park in the cars of the Yellowstone Park Transportation Co. and the Glacier Park Transportation Co., respectively. In the meantime, the special train carried the other members of the party between the three parks of the Rocky Mountains. From Glacier Park the entire party proceeded to Mount Rainier Park by special train. Thus the interpark motor service was inaugurated and travel between parks by special train was likewise begun by this group of Brooklyn people.

Sections of the highway between Rocky Mountain and Yellowstone Parks that were in bad condition prevented the continuation of the regular automobile service throughout the season, but, as I have indicated, this service was maintained between Yellowstone and Glacier Parks for a considerable period of time.

Of course hundreds of motorists traveling in their own cars visited more than one park during the summer, and numerous parties toured every big park of the system.

BY AUTOMOBILE FROM SEQUOIA TO MOUNT RAINIER.

In my own car I covered a large mileage on several of the roads in Oregon, Washington, and California which will become sections of the park-to-park highway when it is finally designated. The tour that I originally planned was to have extended from Sequoia National Park to Yosemite, Crater Lake, Mount Rainier, Glacier, Yellowstone, and Rocky Mountain Parks, but lack of time and conditions demanding return to California from Mount Rainier Park prevented the completion of this tour. However, I covered the highway between Lake Tahoe and Yosemite National Park by way of Tioga Pass, thence I drove to General Grant and the Sequoia Park region, turning northward at Visalia and proceeding to San Francisco, and thence to Crater Lake National Park by way of the coast redwood region of California, inspecting on the way the logging operations that are engaged in cutting the big redwood trees and looking into the possibility of preserving several of the groves of these redwoods that have not as yet been touched.

Leaving Crater Lake Park, I drove to The Dalles, Oreg., on the highway system east of the Cascade Mountains, visiting the thriving city of Bend and other communities en route. From The Dalles to Portland I drove over the wonderful Columbia River Highway. The last leg of the northward journey was from Portland to Tacoma, Seattle, and Mount Rainier National Park.

Compelled to abandon my trip to the Rocky Mountain Park, I returned to Medford, Oreg., over the Pacific Highway, and thence drove directly to Klamath Falls, from which point I moved southward over the lava beds of the Pitt River region, where I visited the beautiful Burney Falls, which John Muir long ago mentioned as one of the most beautiful waterfalls in the State.

Returning to the main highway system of the central part of California, I passed as closely as possible the Hat Creek district of Lassen Volcanic National Park. Practically all of the roads

covered on this tour of more than 4,000 miles will undoubtedly become links in the interpark highway system.

DESIGNATION OF HIGHWAY, FIRST STEP.

Many of the sections of any interpark highway system are, of course, so situated as to naturally require no special designation, and in such cases the roads are either being repaired or plans for their improvement are under way. On the other hand, in several States there are numerous routes that might be selected as sections of the system, and it is necessary to choose one or two routes for special attention if the funds available are not to be spread thinly and ineffectively over all such roads. It is a program of selection of routes that is necessary at this time. Once selected, it would be the advisable thing for all States and local communities through which the park-to-park highway would run to concentrate their funds on these sections of the system before extensively improving other roads.

In the northwest many sections of the interpark system have been designated. Much of this work was done by the National Parks Highways Association, which has headquarters in Spokane, Wash., particularly between Yellowstone, Glacier, Mount Rainier, and Crater Lake National Parks. Some routes have also been designated by the Yellowstone Trail Association; and the National Park-to-Park Highway Association, with headquarters in Cody, Wyo., has selected and marked the Yellowstone highway between Cheyenne and Cody, the eastern entrance to Yellowstone Park.

There is a general disposition on the part of the States of the northwest to improve these roads in advance of other highways, and this is especially true in Montana and Wyoming, where recently-approved bond issues have made considerable sums of money available for road work in cooperation with the Federal Government under the Federal aid laws. In these States roads leading to Yellowstone and Glacier National Parks were among the first to be considered for extensive development.

Wyoming is concentrating most of her funds on roads approaching the east and south gateways to Yellowstone Park, while Montana is making comprehensive plans for a great east and west highway that will bring throngs to the parks from beyond her borders, and for several cross-State roads that will considerably distribute the interpark travel through her communities as it passes from one great park to another. Among these cross-State roads are the Yellowstone-Glacier Bee-Line highway through Livingston, White Sulphur Springs, and Great Falls, traversing the Little Belt Mountains; the "Geysers to Glaciers" highway through Livingston, Bozeman, Helena, and Choteau, by way of Wolf Creek Canyon; and the Flathead Valley route, which takes its course through Butte, Missoula, and Kalispell to the western entrance of Glacier National Park.

Colorado, too, has given special attention to her park-approach roads.

ALTERNATIVE ROUTES ADVISABLE.

When the idea of an interpark highway was first suggested, it was conceived as a great circle route beginning and ending in Denver,

Colo., and following the Rocky Mountains north to and through Rocky Mountain, Yellowstone, and Glacier Parks, thence along to the west side of the Cascades to and through Mount Rainier and Crater Lake Parks, thence into California, skirting the west side of the Sierras and connecting the four parks in that State, thence to the Grand Canyon and by way of New Mexico back to Colorado, with Mesa Verde Park as an objective, and finally completing the circle after making Colorado Springs and Pikes Peak a part of the route.

It is now quite evident that there must be a number of alternative routes in the system and a number of what may be termed small circle tours for the use of motorists who can not complete the big trip in one season. For instance, there must be an alternative route from Denver to Salt Lake City, whence sections will run to the western entrance to Yellowstone National Park, to Zion Canyon, and the north rim of the Grand Canyon, across to Portland, Oreg., and likewise to Lake Tahoe and Yosemite by way of the Lincoln Highway and the Roosevelt Highway. Again, in Oregon an alternative road should skirt the east side of the Cascades from The Dalles through Bend to Crater Lake National Park, thence east of the California mountains on El Camino Sierra to Lassen Volcanic Park, Lake Tahoe, and through Tioga Pass to Yosemite, or through Owens Valley to Southern California and the Grand Canyon; or, perhaps, from Crater Lake through the great redwood forests, where another national park will be established, we hope in the early future, to Muir Woods National Monument, and thence to Yosemite and Sequoia Parks. There are several other such routes. As I have already stated, I traveled over several of these routes during the past summer.

It is expected that the interpark system will be outlined before the elapse of many months. It merely requires now the time of a few enthusiastic believers in the project and the funds to defray the cost of a scouting and promotion tour.

FRIENDS OF INTERPARK SYSTEM GATHER.

On August 10 and 11 a meeting was held in Yellowstone National Park for the purpose of discussing ways and means of expeditiously advancing the selection and improvement of the park-to-park highway and cooperating with this bureau in the encouragement of travel to the parks. Twelve States were represented at the conference, which organized the National Parks Touring Association, to secure the "cooperation and coordination of all State and national highway associations with a view to a composite-road system leading to and connecting the national parks." This association is now completing its organization by the selection of State vice presidents and the appointment of the necessary committees, which will have in hand the formulation of the details of its policies and the means of carrying them into effect. L. L. Newton of Cody, Wyo., is general secretary of the association.

The men who attended the Yellowstone conference have all been identified with good-roads movements in the Western States; they have the broadest conceptions of the purposes to be accomplished by the establishment of a highway connecting the national parks; they

are capable of rising above sectional jealousies and prejudices; and they may be expected to accomplish the end for which they are striving.

NATIONAL AID TO COMPLETE SYSTEM.

I should point out again the fact that some links of any complete park-to-park system of highways may have to be constructed by the Federal Government without State cooperation. In certain States through which the highway would run most of the land belongs to the Federal Government and is either unreserved, unappropriated public land, or reserved for national forests, national parks, or under other forms of withdrawal. There is relatively small taxable property under the jurisdiction of the State. Such country is usually sparsely settled and the burden of building extensive roads would be more than the people could bear. In such cases, particularly where the road would be used principally by motorists en route to the national parks from all parts of the United States, it would seem that the Federal Government would be under the obligation of defraying the cost of such sections of the interpark system. Such a section of the system would be a highway connecting Mesa Verde National Park and the Grand Canyon by way of the Natural Bridges, Rainbow Bridge, and Navajo National Monuments in southeastern Utah and northern Arizona. Practically all of the land such a highway would traverse is under the control of the Federal Government. It should be recalled here that Senate bill 35 providing for the survey of this route for a national highway is now pending in Congress.[1]

GOOD ROADS NEEDED EVERYWHERE.

Never before in the history of this or any other nation has there been such a widespread demand and necessity for good roads as at present. The enormous number of automobiles and trucks that are owned and used by the American people, which is increasing from 10 to 25 per cent annually, and at present estimated at over 7,000,000, has developed the fact that the roads of a few years ago, which in general met the needs of horse-drawn vehicles in a satisfactory manner, are woefully inadequate to serve the motor-propelled traffic of to-day. To remedy this condition the Federal Government, the various States, and the counties of the States are appropriating millions upon millions of dollars to improve existing roads and construct many thousand miles of new roads throughout the Nation, and especially to pave the principally traveled roads with some sort of permanent pavement suitable for automobile travel; all of which will make automobile and truck transportation pleasanter and cheaper, will develop the resources of the States and counties they serve, and will benefit the entire country through offering additional travel advantages, the exchange of money, thought, knowledge, and the recreational benefits that make those who spend their vacations in travel more healthy, virile, and better able to meet the exacting demands of our business life.

[1] See report on S. 4439, a similar bill in the 65th Congress on p. 242 of the 1918 annual report.

PAVING ROADS TO NATIONAL PARKS.

Many of the States and counties in which our national parks are located have provided, or are providing, paved highways to the park entrances. Notable examples of this are found in California, where Tulare County has paved the highway to Three Rivers, the junction of the entrance roads to Sequoia Park, and the State has recently passed a $40,000,000 bond issue containing an item of $300,000 for completing the paving of the roads to the park line; at Yosemite Park, where the State has undertaken the construction of a paved highway from Merced to El Portal; in Oregon, where the State and the Federal Government are engaged in the construction of a highway that will later be paved from Medford to the west entrance of Crater Lake Park, a distance of 72 miles; in Pierce County, Wash., where bonds have been sold and funds set aside to pave next year the Nisqually entrance road to Mount Rainier Park and within the next two years to complete and pave a road to join our proposed new highway up the Carbon River within this park; and in Colorado, where the State is spending $200,000 in improving the entrance roads to Rocky Mountain Park, which they will undoubtedly pave a little later, this in addition to the construction of the Fall River Road, which is being built over the Continental Divide connecting the east and west sides of the park. The State of Montana and several of its counties are engaged in making permanent improvements in roads approaching Yellowstone and Glacier Parks, and Wyoming is rebuilding two roads leading to the south entrance of the Yellowstone, both States concentrating a large portion of their highway funds on these park approaches.

NO MONEY FOR PARK ROAD CONSTRUCTION.

Although there has been such tremendous activity in the construction of roads in the national-park States, practically no money has been available for road extensions in the national parks this year with the exception of a fund provided to complete the rebuilding of the El Portal Road in Yosemite National Park. Work on the highways under our jurisdiction has been confined entirely to ordinary maintenance and repair, while in some parks the funds available have not even been sufficient to prevent perceptible deterioration.

The program covering the expenditure of hundreds of millions of dollars by the Federal Government in cooperation with the States in the building of highways was adopted soon after the close of the war, and the same legislation contained a provision for a comprehensive improvement and extension of roads in the national forests. The road-building program of these measures is to be carried out over a period of years, and in my opinion a similar program, with the appropriation of approximately $1,000,000 a year for extending the existing road system of the parks and undertaking the paving of such parts of this system as may be advisable, should be adopted by Congress.

In regard to the paving of highways, it is certain that this is the only economic means of meeting the constantly increasing road-maintenance expense. In some parks paving must be done, and it

can justly be said that motorists visiting our parks have a right to demand from the Government, as they do, as good, if not better, roads in the national parks than are furnished by the States and counties as approaches to the parks, especially as the Government exacts an entrance fee from the automobile owners for using the park roads.

The greatest immediate need for permanent paving is found in Yellowstone, Yosemite, Crater Lake, and Mount Rainier National Parks, and in order to meet these needs I have incorporated in my estimates for the 1921 fiscal year items for starting the pavment of the most needed sections of the roads in Yosemite, Yellowstone, and Crater Lake Parks and for graveling and providing a sub-base for the pavement of roads in Mount Rainier Park, and I trust that Congress will realize the economic advantage and real necessity for this work. The annual cost of sprinkling and maintaining to a satisfactory standard certain sections of the heaviest-traveled roads in some of the parks will provide the interest on the cost of paving them, their maintenance expense after being paved, and establish a sinking fund to repay the indebtedness in from 20 to 40 years, at the same time adding to the enjoyment and comfort of travel and lessening the expense of those who will use the roads.

As will be noted in the following discussion of the activities of the National Park Service, there are a number of important new highway construction projects ready to be undertaken, all necessary surveys and estimates having been completed and approved. This is the time for the Nation to adopt a broad-guage road extension and paving program for the national parks, and I sincerely trust that it may be approved by Congress in connection with our budget for the next fiscal year.

GENERAL ENGINEERING DEPARTMENT.

Much important work has been accomplished during the past year in development and execution of general engineering projects under the direction of Civil Engineer George E. Goodwin. The general engineering division is charged primarily with the formulation of plans for new roads and trails, the gathering of all data relating to such projects, and the preparation of the same for the approval of the Service and final submission to Congress when adopted by the Service and the department. As necessity arises, however, engineering work is carried to completion by the civil engineer. Throughout the working season of 1918 he supervised the maintenance and improvement of the roads of the Yellowstone.

NEW ROADS PLANNED AND SURVEYED.

During the past year the most important project to be developed was that covering a transmountain road connecting the east and west sides of Glacier Park. The survey was undertaken during the autumn of 1918, and the project, with all quantities and estimates, was framed during the winter. It is now ready to submit to you for final approval as a part of the Glacier Park budget for the 1921 fiscal year.

Another very important survey undertaken and now approaching completion is a part of a road project which contemplates the connecting of the Yosemite Valley with Tenaya Lake on the Tioga Road by a highway up the Merced Canyon to Little Yosemite Valley, thence along the route of the trail to Clouds Rest and Forsyth Pass, and thence along the upper reaches of Tenaya Canyon to the lake.

Of equal value from almost every standpoint is the survey of a road in Sequoia Park, which has just been completed. This highway will connect the road in the valley of the Middle Fork of the Kaweah River with the Giant Forest and will ascend the steep slopes of the mountain of which the famed Moro Rock is the commanding feature. Construction work should begin on this road next year.

ENGINEERING STUDIES IN GRAND CANYON AND OTHER PARKS.

Reconnaissance and other surveys and preliminary examinations of prospective road routes were also conducted in Grand Canyon and Mount Rainier National Parks. A road along the rim of the Grand Canyon from El Tovar Hotel to Grand View is the important project of the former park, and in the latter a highway up the Carbon River to the mouth of the Carbon Glacier is the next improvement to be made.

Another proposed highway route examined by the general engineer is known as the Trail Ridge "Y" route in Rocky Mountain National Park. This road, when constructed, will leave the Fall River Road and run along the crest of the Rockies for several miles. At some future date it will be constructed down Windy Gulch to the lower levels of the park. Work on this road should begin next season.

ROAD PROJECTS OF THE EARLY FUTURE.

Among other projects to be surveyed and developed in the early future are the proposed highways to Fern Lake and Loch Vale in Rocky Mountain Park, and a road from Moraine Park to the region of Longs Peak post office in the same park; a road to the top of Mount Evans, if the territory including this mountain is added to Rocky Mountain Park; a road from Grayling Creek to the Madison River in Yellowstone Park, thus greatly improving access to the main highway system of this park from the Gallatin Valley; and new roads to Leigh and Jenny Lakes in the area proposed for addition to Yellowstone Park; a road to Diamond Lake from Crater Lake, in the event that the Diamond Lake region is added to Crater Lake National Park; and roads to Wetherill Mesa and to the Shiprock highway from the existing highway system of Mesa Verde Park.

TRAIL ROUTES EXAMINED AND BRIDGES DESIGNED.

Trail surveys and studies conducted by the general engineering division include several important projects in the Grand Canyon Park and in the Belly River district of Glacier Park. The most important engineering project completed under the direct supervision of this division during the year was the construction of the new road in the Gardiner River Canyon, Yellowstone National Park, thus eliminating the menace of a sliding hill which has endangered traffic in the can-

yon for many years. Another valuable piece of construction work accomplished directly by the division was the installation of a water system in Muir Woods Monument.

Several very important bridges were designed by the division, and the projects were carried forward to the point of letting contracts for actual construction work. Among the bridges designed were the new Marble Fork Bridge for Sequoia Park and an under-pass bridge for Sylvan Pass, Yellowstone Park, to replace the well-known "corkscrew" bridge. Plans are now in course of development for a new bridge over the Flathead River at Belton at the western gateway to Glacier Park.

USE OF T. N. T.

Even in this brief discussion of some of our engineering problems in the national parks I do not want to overlook giving credit to T. N. T. for the splendid results which it has been possible to accomplish with this material. Of the great quantities of surplus explosives which the War Department had on hand at the close of recent hostilities, the National Park Service was successful in securing a considerable amount of trinitrotoluene, or T. N. T., as it is popularly called. This powder has been utilized for blasting purposes in road and trail building and the like and has given uniform satisfaction, besides effecting no small saving by making it unnecessary for us to purchase large quantities of dynamite and blasting powder as has been done in the past. Where justified, we have obtained quantities of T. N. T. for some of the parks sufficient to care for our needs for the next several years.

VALUABLE ENGINEERING WORK AND ADVICE.

I am greatly pleased with the accomplishments of the engineering division, and I feel that in establishing it for the purpose of planning new road and other development, and advising the park superintendents, as well as performing extremely valuable inspection service, the field force of the bureau has been greatly strengthened. On the other hand, the existing satisfactory method of managing the individual parks—that is, through centralizing all powers relating to administration, protection, maintenance, and improvement in the superintendents—has been constantly maintained.

LANDSCAPE ENGINEERING DEPARTMENT ESTABLISHED.

In my last annual report I mentioned the appointment of Charles P. Punchard, jr., as landscape engineer in the field forces of the National Park Service. In recommending the establishment of the position of landscape engineer, I had some very definite objects in mind as possible of attainment only through the advice and assistance of a man trained in landscape architecture and yet possessed of the ability and willingness to take a very practical view of the problems to be solved, and to attack them always with full appreciation of the limitations of the park appropriations and the relation of these problems to other features of improvement of the park system. Mr. Punchard has met the difficult requirements of the place and has already made his department one of the most important influences for the betterment of the national parks.

The landscape engineer devoted a considerable portion of the year to travel in the parks of the West for the purpose of studying their various types of scenery and analyzing in some detail the landscape problems that awaited early solution, while broadly observing conditions requiring treatment according to his advice in the more or less distant future. The parks visited during the year were Yellowstone, Yosemite, Grand Canyon, Rocky Mountain, Mount Rainier, Crater Lake, Sequoia, General Grant, and Hawaii. Inspections were also made of Muir Woods, Casa Grande, Papago Saguaro, and Tumacacori National Monuments.

PERMANENT CAMP IMPROVEMENTS PLANNED.

In Yellowstone and Yosemite National Parks several months were spent by Mr. Punchard in planning the location and development of permanent camps or the rehabilitation of existing camp systems. The rearrangement and the improvement of the big camps of the Yellowstone Park Camping Co. and the reconstruction of Camp Yosemite, owned by the Yosemite National Park Co., presented exceedingly important problems that are still receiving much attention.

The location and improvement of automobile camps for private motorists has been another extremely important task of the landscape engineer. During the year a complete camp system was outlined for Yellowstone National Park, and satisfactory progress was made on similar plans for several other reservations, notably Yosemite and Sequoia Parks.

LANDSCAPE ARCHITECTURE AND PARK GATEWAYS.

One of the most complex problems of park development is that relating to the marking of park entrances with appropriate gateway structures. This landscape problem has been studied in a number of parks with very satisfactory results. Plans are now complete for several gateways that will be a distinct credit to the service. They will be entirely unique, yet as harmonious with their surroundings as any similar structures that I have seen. For some parks special appropriations must be secured before necessary gateways can be built, but I feel certain that the funds for these improvements will shortly be forthcoming. In all of my reports I have emphasized the advantages of the park gateway, not the least of which are the sense of pride and the thrill of pleasure that are inspired in the American tourist as he passes through imposing pillars or arches that announce to him that he is entering a great playground that belongs to him and to all America.

ATTRACTIVE BUILDINGS DESIGNED AND SITES SELECTED.

Besides the designing of gateways, it has been the duty of the landscape architect to plan employees' cottages, ranger stations, gasoline and oil stations, automobile checking stations, comfort stations, etc., or to criticize plans submitted by the superintendents for such buildings. Locations for buildings of all kinds, whether they are to be erected by the Government or by the business interests catering to the needs of the public, are selected by the superintendents of the parks in conference with the landscape engineer on the ground, and all timber of the parks necessary in construction of such buildings is selected and marked for cutting by these officers.

FORESTS AND LAKES RECEIVE SPECIAL ATTENTION.

The landscape engineer has also given his attention to forest improvement and vista thinning in certain parks with excellent results. Closely related to this is the problem of preserving stands of trees along highways crossing private holdings, the clearing up of brush and down timber along roadsides, and the elimination of dead timber in flooded lakes, such as Lake Eleanor in Yosemite Park. These problems are especially hard to solve in some cases because of the expense involved in making the necessary improvements, and in others because of the lack of interest in this work on the part of private individuals or corporations possessing property rights in the park waters or along the roads, or positive unwillingness on the part of such parties to cooperate in any way.

STRICT CONSERVATION PRINCIPLES GOVERN LANDSCAPE BETTERMENT.

In all of our landscape work the guiding principle followed is that the natural conditions of the parks must be disturbed as little as possible consistent with necessary development in the public interest, and where such conditions have been unnecessarily or carelessly or wrongfully changed in the past they must be restored where this can be done, and in any case made less objectionable if restoration to a state of nature is impossible. This principle is a corollary of the governing rule in our general policy that "the national parks must be maintained in absolutely unimpaired form for the use of future generations as well as those of our own time."

For lack of space I have only briefly discussed a few of the functions of the landscape engineering department, and have touched only two or three of the salient features of our landscape betterment program. The details are to be found in the report of the landscape engineer in Appendix B and in the reports of the superintendents of a number of the parks. They are worthy of careful perusal. It is desirable that the public know of this progressive and enlightened landscape work, and it is to be hoped that this work will be helped by the encouraging and assisting criticism of the people using the parks. Unfortunately there has been some recent adverse criticism of landscape conditions in the parks by tourists who know our policies regarding betterments, but who refuse to consider the practical difficulties in the way of accomplishing everything in a single year.

VALUABLE AID IN LANDSCAPE PROBLEMS.

Time and opportunity have combined this year to make it possible to give a great amount of consideration to the preservation and, in some cases, the restoration of the native landscape of the national parks. In this activity I have been fortunate in receiving the advice and assistance of several noted architects and landscape engineers. For instance, Mr. Charles Moore, chairman of the Commission of Fine Arts, accompanied me on a tour of inspection of Yosemite National Park and a part of the proposed Roosevelt National Park. On this trip his helpful criticisms were the source of inspiration and greatest encouragement to me.

Mr. Frederick Law Olmsted, former chairman of the Commission of Fine Arts and always interested in national park progress, visited

Lafayette Park during the year and made some very interesting and constructive criticisms of conditions in that park which will profoundly influence its improvement.

In December, 1918, Mr. Jens Jensen, landscape architect of Chicago, made a trip to Hot Springs Reservation, and gave his time, without charge, to the Government in supervising the planting of a large quantity of tulip, narcissus, hyacinth, and other bulbs on the Reservation area. He also made several valuable suggestions relating to landscape improvement of the Reservation and the city of Hot Springs.

AEROPLANES IN THE NATIONAL PARKS.

The close of the war brought no decrease in the public interest in the construction and operation of aircraft. The minds of the people merely turned more definitely to the use of the aeroplane for pleasure and for commercial purposes. It was natural, therefore, that during the past season the aeroplane should have appeared in the national parks.

On May 27 Lieut. J. S. Krull, flight commander at Mather Field, near Sacramento, Calif., landed in Yosemite Valley after a successful flight from Mather Field. This is the first aeroplane to fly into the famous valley. Later Lieut. Neubig, also of Mather Field, landed in the valley with a passenger, after a nonstop flight of 2 hours and 40 minutes, coming from San Francisco, a distance of approximately 180 miles.

The first aeroplane to fly over Rocky Mountain National Park landed near the Stanley Hotel on August 8, 1919. It was piloted by Mr. I. B. Humphreys, who was accompanied by Mr. A. M. Lendrum. The machine used was a Curtis-Oriole biplane.

Tentative proposals to operate aircraft in the national parks for the purpose of transporting passengers have been made from time to time during the year, but as yet no complete proposition has been submitted to the National Park Service. Among the tentative proposals were suggestions that an aeroplane line be established between Yellowstone and Glacier National Parks, with side trips through the parks themselves, and that aeroplanes be used as means of connecting the north and south rims of the Grand Canyon of the Colorado. While the former proposal is believed to be partly feasible, the latter is probably wholly impracticable, because of the fact that it would be necessary to rise to a great altitude above the Grand Canyon in order to obtain the proper factor of safety. This would necessitate taking passengers to an altitude of from 10,000 to 14,000 feet above the sea, which would result in occasional distress and injury, and, of course, the Grand Canyon from such an altitude would be indistinct. I am of the opinion, however, that aeroplanes can be used to great advantage in several of the national parks, and undoubtedly the time is not far distant when service between the parks can be maintained by the use of heavier-than-air machines.

Experiments conducted during the past year in California, particularly from the base at Mather Field, have determined the practicability of using the aeroplane for fire patrols over forested areas. Patrols have been made in the national forests in the State of California with great effectiveness, and during the recent ex-

tensive forest fires they rendered much aid in detecting and controlling the flames. It is to be hoped, as Yosemite and Sequoia Parks are not far distant from Mather Field, that some arrangements can be made next year for regular fire patrols by aeroplane over these park areas. Owing to the expense of maintaining aeroplanes near other parks, we may not be able to utilize them for fire patrols at present, but they could be used to great advantage in all of the parks of the Rocky Mountains where the fire hazard is often great and where during the past summer there were unusually large fires to contend with.

THE NATIONAL PARKS IN THE FIELD OF EDUCATION.

In my report for last year and in statements issued from time to time from the National Park Service I have called attention to the fact that the national parks and monuments have educational advantages of value which have not as yet been utilized to any appreciable extent either by the colleges and universities of the Nation or by individual scholars and scientists unassociated with particular institutions. As I have gone about the parks this year, their usefulness as fields for practical summer investigations in numerous branches of scientific and historic research have impressed me more forcibly than ever before, and I am extremely anxious that steps should be taken in several of the largest parks next year to demonstrate the practicability of conducting studies of the natural features at reasonable expense to students availing themselves of the opportunities for the field laboratory work that the parks afford.

NATIONAL PARKS STUDIED AT COLUMBIA.

I have not intended to convey the idea that there is not a deep interest in this proposed educational use of the national parks outside of the National Park Service. There are many far-seeing educators, public officials, and men and women in several very different walks of life who are thoroughly alive to this enlarged opportunity. Several associations with high public aims have also become interested in the subject. Columbia University has definitely opened the field of national parks study as a distinct feature of its curriculum. It has announced, and is actually conducting, a course in the scenery of the national parks, with special emphasis on its production or formation by the forces of nature that have developed the surface of the earth and are to-day modifying and changing it. It is not unlikely that Columbia will follow this course with a field expedition of faculty members and students to one of the national parks.

THE LE CONTE MEMORIAL LECTURES.

Meanwhile the University of California, through its extension division, has established courses of lectures on the national parks which are to be given each year in Yosemite Valley. These are to be known as the Le Conte Memorial Lectures, in commemoration of the late Prof. Joseph Le Conte's devotion to Yosemite National Park and his contributions to science.

The first course of these lectures was delivered in Yosemite Valley this season, in accordance with the following program:

I. Willis L. Jepson, professor of botany, University of California:
   1. The History and Origin of the Buttercup Family in Yosemite. Tuesday, June 24.
   2. The Biology of the Chaparral. Thursday, June 26.
   3. The Ancestry of the Yosemite Pines and Sequoias. Friday, June 27.

II. William Frederic Badé, literary executor of John Muir:
   1. John Muir, Nature, and Yosemite. Tuesday, July 1.
   2. Muir's View of the Valley's Origin. Thursday, July 3.
   3. Muirs Services to the Nation. Friday, July 4.

III. François Emile Matthes, geologist, United States Geological Survey:
   1. Origin of Yosemite Valley, as Indicated in the History of its Waterfalls. Tuesday, July 8.
   2. The Highest Ice Flood in the Yosemite Valley. Wednesday, July 9. (To be delivered at Glacier Point.)
   3. The Origin of the Granite Domes of Yosemite. Saturday, July 12.

IV. A. L. Kroeber, professor of anthropology, University of California:
   1. Tribes of the Sierra. Friday, July 11.
   2. Indians of Yosemite. Saturday, July 12.
   3. Folk-lore of Yosemite. Sunday, July 13.

The 1920 series will probably include lectures by Dr. C. Hart Merriam on anthropological subjects—by Dr. J. C. Merriam on the Philosophy of Le Conte; by Dr. Joseph Grinnell on zoology; and by Dr. A. C. Lawson on geology.

CAMP FIRE EDUCATIONAL TALKS.

Dr. Matthes, of the Geological Survey, who delivered some of the Le Conte lectures during the past season, remained in the park for a considerable time and delivered many talks and addresses at the public camps and at the Sierra Club camp fires. Likewise, in Yellowstone National Park, Mr. M. P. Skinner, who has studied the wild flowers, mammals, and birds of that park for many years, gave talks on the features of the park to Howard Eaton's big trail party at its camp fires and to other interested groups of visitors. He is now engaged in collecting specimens for the new Yellowstone museum. Informal talks on Yellowstone Park were also given by Mr. Frank Reedy, of the Southern Methodist University, who has been visiting the park each summer for many years.

While the Brooklyn Eagle party was visiting Yellowstone and Glacier National Parks, Miss Isabel D. Bassett, formerly of the faculty of the department of geology at Wellesley, gave interesting and instructive talks on the geysers and hot springs of Yellowstone Park and the peculiar geological formation of Glacier Park.

In Mesa Verde National Park, Dr. J. Walter Fewkes, chief of the Bureau of Ethnology, continued his archæological work by excavating Square Tower House, one of the finest cliff dwellings of the park, and likewise he followed his custom, established some years ago, of telling around the camp fire the story of the cliff dwellers and their customs and works.

In the far Southwest, Dr. Byron S. Cummings conducted a class of students in archæology and ethnology to the Grand Canyon National Park and to the remote Navajo National Monument in northern Arizona.

Nature guides in Mount Rainier and Rocky Mountain Parks have done much to stimulate interest in the wild flowers, trees, and animal

life of these reservations, as well as in the glaciers and the mountains themselves. Still, in mentioning these instances of the newest use of the national parks, I do not by any means touch upon all of the educational work that has been accomplished this year.

MUSEUMS TO BE ESTABLISHED.

Last year I mentioned the establishment of a museum in Mesa Verde National Park to house relics taken from the cliff dwellings and other prehistoric ruins. This museum has become one of the most interesting features of the reservation and has been thoroughly enjoyed by the traveling public. Dr. Fewkes used it for his talks on archæology.

A new administration building has been planned for Yosemite National Park, and in designing this structure provision was made for a large museum, to be constructed with every modern appliance for effective exhibitions. The lighting methods for habitat groups adopted by the California Academy of Sciences for its new museum in Golden Gate Park, San Francisco, will be utilized in this building if authorized.

In Yellowstone National Park a large room in a building formerly a part of Fort Yellowstone, which has been selected for park headquarters, will be developed as a museum to house specimens of the hundreds of different objects of interest that the park contains. These specimens are now being collected and marked for exhibition. It will take several years to complete the display, but ultimately it will be complete in every particular.

In Casa Grande National Monument a collection of prehistoric implements and other relics of interest to the visitor has been made available by Custodian Pinkley, who has also assembled a library on archæology and ethnology that is quite comprehensive. A suitable museum to house this collection is now under consideration.

The superintendent of Rocky Mountain National Park has assembled a vast number of specimens of wild flowers and some exhibits of mounted birds and animals that are attracting considerable attention. I do not know of any work that the National Park Service is undertaking that is of more value to the public than this use of the resources of the parks for the enlightenment of their visitors.

NATURAL HISTORY SERIES OF PUBLICATIONS.

Last year we published "Wild Animals of Glacier National Park," a volume on the mammals of the park by Mr. Vernon Bailey, chief field naturalist of the Biological Survey, and on the birds, by Mrs. Florence Merriam Bailey, and this book was so favorably received that the edition was soon exhausted. A second edition is in course of publication. Continuing the preparation of this natural history series, we were fortunate in securing the cooperation of the Smithsonian Institution in assembling data for a book on the wild flowers and trees of Glacier Park. Dr. P. C. Standley, of the Smithsonian Institution, was sent to the park to gather the necessary data, and he will write a popular book which the Service will publish early next year. Technical papers will also be prepared for the use of the National Museum and other scientific institutions.

Under a similar cooperative arrangement, the Biological Survey, the State College of Washington, and the National Park Service are conducting investigations in Mount Rainier National Park for the purpose of gathering data for a popular volume on the wild life of that park. Dr. W. P. Taylor of the Biological Survey is in charge of the party, and Dr. William L. Finley, State biologist of Oregon, is doing the photographic work, which will include motion pictures of the mammals and birds.

THE NATIONAL PARKS ASSOCIATION.

That the Service might be supported by outside institutions and individuals in its advancement of the educational use of the national parks, a group of men and women in June, 1918, organized the National Parks Educational Committee, under the leadership of Charles D. Walcott, Secretary of the Smithsonian Institution. This organization was noted in my last report. Its activities were limited during the war, but its opportunities broadened and increased with the dawn of peace, and it was decided early in the year to establish a national organization to promote the aims of its founders. On May 29, 1919, such an organization was formed. It was called the National Parks Association, and its objects can be best conveyed to the reader by quoting direct from a bulletin issued from its headquarters at Room 914, Union Trust Building, Washington, D. C. They are as follows:

1. To interpret the natural sciences which are illustrated in the scenic features, flora and fauna of the national parks and monuments, and to circulate popular information concerning them in text and picture.

2. To encourage the popular study of the history, exploration, conditions, and folk lore of the national parks and monuments.

3. To encourage art with national park subjects, and the literature of national parks travel, wild life and wilderness living, and the interpretation of scenery.

4. To encourage the extension of the national parks system to represent by consistently great examples the full range of American scenery, flora and fauna, yet confined to areas of wilderness so extraordinary that they shall make the name national park an American trade-mark, as the competitive bids the world's travel; and the development of the national monuments into a system illustrative of the range of prehistoric civilization and early exploration and history, land forms, American forest types, wild life, etc.

5. To enlist the personal services of individuals and the cooperation of societies, organizations, schools, universities, and institutions in the cause of the national parks and monuments.

Henry B. F. Macfarland, of Washington, D. C., is the president of the new association. The vice presidents are Nicholas Murray Butler, president of Columbia University; John Mason Clarke, chairman of the section of geology and paleontology, National Academy of Sciences; William Kent, of California; and Henry Suzzallo, president of the University of the State of Washington. The executive secretary is Robert Sterling Yard, formerly chief of the educational division of the National Park Service. Huston Thompson, member of the Federal Trade Commission, is chairman of the ways and means committee, which is composed of all of the charter members of the association. Charles J. Bell is treasurer.

HELP OF THE MOUNTAINEERING CLUBS.

The mountaineering clubs of the country, which have effectively aided in the advancement of the interests of the national parks ever since the establishment of this bureau, and in many instances, ever since the creation of certain national parks, continued to render all assistance possible during the past year, not only in the promotion of the broader uses of the parks such as the educational use just covered, but in actually sending parties and individual members into several of the parks for outings and to consult with park officers in improvement plans.

The Associated Mountaineering Clubs of North America, with headquarters in New York City, kept closely in touch with national park activities and through its bulletins distributed to the various member clubs data regarding progress in the development of the parks. The general secretary of the association, Mr. LeRoy Jeffers, visited Yellowstone and Glacier National Parks during the summer and climbed some peaks, notably Mount Moran (altitude 12,100) in the Teton Mountains in the proposed extension of Yellowstone Park, making the first ascent of this granite peak. He also visited some of the parks of the Canadian national park system.

MOUNTAINEERING CLUB OUTINGS.

More of the big mountaineering clubs conducted outings in the national parks during the summer than ever before. A party of the Appalachian Club visited Lafayette National Park on Mount Desert Island, Me., and were delighted with the opportunities for club outings in this reservation. Several members of this club, including Messrs. Frederick Law Olmsted, Allen Chamberlain, of the Boston Transcript, and Herbert W. Gleason, the lecturer, visited the park for the purpose of consulting with our superintendent on various phases of the development of the reservation and its promotion as a member of the park system.

The Colorado Mountain Club held its annual outing in Wild Basin, Rocky Mountain National Park, in August, and in February sent several members to the winter carnival at Fern Lodge in that park.

One of the members of this club, Mr. Roger W. Toll, became superintendent of Mount Rainier National Park on May 10, 1919. Mr. Toll's book, "Mountaineering in the Rocky Mountain National Park," which was issued by the service early this year, was compiled in part from the very comprehensive mountain climbing records of the club.

Several members of the Prairie Club, of Chicago, enjoyed the Wild Basin outing of the Colorado organization.

The Mazamas, with permanent headquarters in Portland, Oreg., held their annual outing in Mount Rainier National Park. They were in the park nearly three weeks in August, and made many climbing trips. Their main camp was on Mazama Ridge, an old and favorite camping ground of this organization.

The Mountaineers of Washington likewise selected Mount Rainier National Park for their summer outing. They walked completely around Mount Rainier, spending three weeks in the park. This

club will hold its annual winter snowshoe outing in that park on New Year's Day. Elsewhere in this report I have mentioned the plans of the Mountaineers to erect near Sluiskin Falls, in the Paradise Valley region, a memorial to the late Gen. Hazard Stevens, who, with P. B. Van Trump, made the first ascent of Mount Rainier, in 1870.

The Sierra Club, of California, again visited Yosemite National Park on its annual outing. Its headquarters at Tuolumne Meadows, however, was used throughout the summer by visiting members. On the regular outing, which was enjoyed by a very large group of members, trips were made to the Devil Postpile, Mount Ritter, the Ten Lakes Basin, and many other high Sierra points. Several members of the Sierra Club joined me on my trip to Yosemite Valley in late December, 1918, some of these climbing in the snow to Glacier Point.

A list of the associated mountaineering clubs and their officers is given in Appendix G.

WILD-LIFE CONSERVATION.

No opportunity to improve the condition of the wild life of the national parks has been neglected by the Service during the past year, nor have we relaxed in any degree our vigilant protection of these reservations. All are refuges for wild animals, and some of them are among the finest preserves in the world. However, conditions over which we have not had control have affected our charges more or less adversely. Lack of funds made it impossible for us to assume charge of Mount McKinley National Park, which was established nearly three years ago as a game conservation measure; failure of the Legislature of California to pass a bill, strongly urged upon it, which would have established a game preserve west of Yosemite Park, leaves the deer of the Yosemite in a rather unsatisfactory situation; an epidemic of hemorrhagic septicemia caused the death of 36 animals of the tame herd of buffalo in Yellowstone Park; and the Blackfeet Indians took their regular toll of elk and bighorn sheep belonging to Glacier Park as these animals came down from the mountains to the plains of the Indian Reservation.

In other respects, however, the wild animals of the parks have thrived splendidly. An open winter in nearly all of them made grazing conditions good. On the other hand, the prospect that a long cold period will occur in the winter that is approaching is causing us uneasiness because the drought of the summer dried up the ranges in several parks and some species of animals, particularly the elk of the Yellowstone, are likely to leave these preserves and pass beyond control. In case they do this, there may be heavy losses through unlawful killing of the animals or, in the case of the northern herds, through starvation.

This brings me to a renewal of the statements of previous annual reports of the Service that in several States more attention should be given to the establishment of game preserves adjoining the national parks, particularly in California, where a preserve of reasonable size should be established along the western side of Yosemite National Park; in Oregon, where large refuges around Crater Lake National Park are essential to the preservation of the growing herds

of animals of this reservation; and in Washington, where the wild life of Mount Rainier National Park is in dire need of better protection after it leaves the park boundaries. Of course the problem of protecting the elk of the Yellowstone after these animals leave the park boundaries in winter is still most serious. All of these needs are discussed under the sections of this report relating to our activities in the various parks. In Wind Cave and Sullys Hill National Parks game preserves are maintained under the supervision of the Biological Survey, and recent appropriations for the latter park will make possible its larger development as a game refuge.

Our efforts to reduce the number of predatory animals in the national parks have met with unusual success during the past year, and in several of the bigger parks so many of these animals have been killed that there has already been a noticeable increase in the deer and other species that are usually their victims.

NOTES ON FISH AND FISHING.

Fishing in the national parks was excellent during a large part of the season. In several of the parks the unusually large number of tourists enjoying the sport greatly depleted the streams. Large consignments of fish were planted in practically all of the parks where there are suitable waters, but it is apparent that hereafter this restocking of the lakes and streams must be conducted on a larger scale. Fish hatcheries were operated by the Federal Government in Yellowstone and Glacier National Parks, but consignments of fry in other parks were usually given to the Service by the States. In Yosemite National Park a temporary hatchery was maintained by the State preparatory to building a permanent station. Plans for the construction of this station, however, have been temporarily suspended and we are not certain that the type of building that the National Park Service will approve will be authorized by the State government. The State of California also maintained a temporary hatchery on one of the branches of the Kaweah River, near Three Rivers and close to Sequoia Park, and the Fish and Game Commission expects to convert this establishment into a permanent hatchery. Fish for Rocky Mountain National Park were supplied through the cooperative efforts of the Federal hatchery at Leadville and the hatchery maintained by the State in the park itself.

During the season the United States Commissioner of Fisheries, Dr. Hugh M. Smith, spent considerable time in Yellowstone National Park studying the fish supply and making plans for stocking its waters on a larger scale. He also collected data to be used by his bureau in cooperation with the National Park Service in an effort to make Yellowstone one of the greatest fishing resorts of the Nation. The opportunity to make such a resort of this big park is all that can be desired, as there are hundreds of lakes and streams that are suitable for the various species of trout, many of which have not yet been stocked for the first time.

There is no feature of the park improvement that appeals more to me than the maintenance of good fishing waters for the visiting public, and it is my purpose to cooperate in every possible way with the Federal Bureau of Fisheries and the State commissions in intensively

improving the opportunities for the sport of fishing in every national park where this can be done.

TWO NEW NATIONAL PARKS.

For a time, in the early part of the current calendar year, it appeared as if 1919 would become the most important year in the recent legislative history of the national park system. Bills providing for the establishment of the Grand Canyon and Lafayette National Parks were passed by both Houses of Congress, and the inhibition on the appropriation of more than $10,000 annually for Rocky Mountain National Park was repealed. A bill providing for the enlargement of Sequoia National Park and renaming it Roosevelt National Park was passed by the Senate unanimously, and an equally important measure enlarging Yellowstone National Park was approved unanimously by the House of Representatives. These last two measures, however, failed of final enactment in the closing days of the Sixty-fifth Congress. Nevertheless, the measures that were put on the statute books during the year marked a tremendously important step in rounding out the park system. It should be noted also that the legislature of California passed a law ceding jurisdiction over Yosemite, Sequoia, and General Grant National Parks to the Federal Government.

By the establishment of the Grand Canyon and Lafayette National Parks, the number of parks was increased to 18, while the monuments under the National Park Service were reduced to 23, Lafayette Park having been Sieur de Monts National Monument prior to its advancement to the park class. The creation of the Grand Canyon National Park also reduced the number of monuments under the control of the Department of Agriculture to 10.

The total area of the national parks is now 10,739 square miles, or 6,872,960 acres, and the area of the national monuments is 1,931 square miles, or 1,235,840 acres. There is one national park on the Hawaiian Islands, one in Alaska, and 16 in the States. Lafayette Park is the first scenic national park to be established east of the Mississippi River. There are two monuments in Alaska that are under our jurisdiction, but the others are in the States west of the Mississippi.

The first national park to be established was Hot Springs, first set apart in 1832. Yellowstone came second in 1872, and its development by the Government was really undertaken in advance of the former park. The last parks to be created, Lafayette and Grand Canyon, were both established on the same date—February 26, 1919.[1] The first monument to be established was Devils Tower National Monument in Wyoming, September 24, 1908, although Casa Grande National Monument was first reserved in 1892 under a special act of Congress relating to that particular group of ruins.

SYSTEM NOT YET COMPLETE.

There are several important steps yet to be taken by Congress before the national-park system is complete. Several new national parks should be added to the group already created, and there should be some important extensions of a number of the existing parks.

[1] See texts of the organic laws on p. 1215 and p. 1218.

These extension projects will be discussed later in this report under the outlines of the needs of the respective parks. They include the enlargement of Sequoia National Park and the changing of its name to Roosevelt National Park[1] the inclusion of the Teton Mountains and other scenic territory in Yellowstone National Park,[2] the addition of the Diamond Lake region to Crater Lake National Park,[3] and the extension of Mount Rainier Park to take in Ohanapecosh Hot Springs.[4] Likewise there is a pressing necessity for adding the Mount Evans region to Rocky Mountain National Park.[5] It is not unlikely that certain changes should be made in Yosemite National Park, some lands being excluded and other lands in the High Sierra being included. Also, it seems essential that the east boundary line of Glacier National Park be extended to the section of the park highway that traverses the Blackfeet Indian Reservation.[6]

PARK STATUS FOR ZION AND BANDELIER MONUMENTS.

Two national monuments should be raised to the dignity of national parks. One of these, Zion National Monument in Utah, is already receiving the consideration of Congress, and a bill providing for its elevation to the park class has been passed by the Senate.[7] It was slightly amended in the House of Representatives and at this writing the amendments are being considered in conference. The other project relates to Bandelier National Monument in New Mexico. Now situated in a national forest, it is under the control of the Department of Agriculture. It contains a vast number of prehistoric ruins, including cliff dwellings entirely different from any in Mesa Verde National Park, enormous pueblos, and several remarkable shrines. Furthermore, these interesting objects of antiquity abound in a beautiful mountainous region accessible by railroad and automobile. When made a national park, this region would splendidly complement Mesa Verde Park.

Two bills providing for giving the Bandelier Monument and its surrounding region a park status are now pending in Congress. One proposes to call the new park the National Park of the Cliff Cities, and the other measure contemplates the establishment of the Pajarito National Park. The latter bill covers a smaller territory than the former, but nevertheless it includes within the boundaries it delineates all of the prehistoric ruins and the finest scenery of the region.

THE PROPOSED REDWOOD NATIONAL PARK.

In my report for last year I mentioned that plans were being formulated for the acquisition of a stand of redwood trees of the species *Sequoia sempervirens*, which is native to the coast regions of California and southern Oregon. Splendid forests of these trees are fast being cut, and if anything is to be accomplished in

[1] See p. 985. Also Congressional Committee reports on p. 1224.
[2] See p. 961. Also Congressional Committee report on p. 1233.
[3] See p. 999.
[4] See p. 996.
[5] See p. 1204.
[6] See p. 974.
[7] See p. 1030 for discussion of merits of project and p. 1242 for Congressional Committee reports.

the way of preserving a tract of the best of these trees it must be done quickly. This necessity for immediate action prompted the organization of the Save the Redwoods League, of which you are the head. Since the organization of the league was completed much has been accomplished, particularly in bringing to the attention of the people the precarious situation of the redwoods, and in stimulating interest in their preservation.

On July 8, 1919, Congressman Clarence F. Lea, of California, introduced in Congress House resolution 159, which brings the redwood problem definitely before Congress and which, if adopted, will result in the presentation of a comprehensive report on the redwood situation to the national legislature which may secure national aid in preserving these noble trees. The resolution reads as follows:

Resolved, That the Secretary of the Interior be, and is hereby, directed to investigate and report to the House of Representatives as to the suitability, location, cost, if any, and advisability of securing a tract of land in the State of California containing a stand of typical redwood trees of the species *Sequoia sempervirens* with a view that such land be set apart and dedicated as a national park for the benefit and enjoyment of the people of the United States and for the purpose of preserving such trees from destruction and extinction, and also as to whether or not the whole or any part of such lands or the purchase price thereof would be donated to the United States, and the probable cost of maintaining such lands as a part of the national park system.

On my recent automobile trip over some proposed sections of the park-to-park highway during the past summer, I visited some of the best groves of redwoods in California. I was strongly impressed not only with the importance of preserving one or more big groves of redwoods, but of making the highways which are to be provided by the State through this region an alternative route of the interpark road system.

I was accompanied by Mr. Madison Grant, of the New York Zoological Society, who, acting in the capacity of organizer for the Save the Redwoods League, assisted me greatly in bringing the attention of the local communities to the importance of preserving timber along all of their highways.

In connection with the preservation of groves of the redwood trees three lines of activity have been proposed, as follows:

(1) The acquisition of a large tract of redwood timber as a national park.

(2) The establishment of county parks by Humboldt, Del Norte, and Mendocino Counties, each of which would preserve rather small but exceedingly important stands of redwoods. Such a park has already been established by Sonoma County, which recently acquired the well-known Montgomery grove of 7,000 acres.

(3) The construction by the State of California of a highway through the redwood regions, preserving strips of timber from 300 to 1,000 feet wide as a part of this road project, the highway to run through the center of the safeguarded strip.

If these projects could all be carried out, examples of the finest stands of timber that have ever been known in the history of the earth, according to eminent authorities like Henry Fairfield Osborn, president of the American Museum of Natural History, would be preserved for all time, and if properly brought to the attention of the

public through the medium of maps showing the newly acquired areas, together with Muir Woods National Monument and the present State Park in the Big Basin, San Francisco, motorists visiting California would find a marvelous exhibit of redwoods to enjoy. Add to this a trip to Sequoia and General Grant National Parks and to the Mariposa Grove in Yosemite National Park, and a "redwood trip" would be possible that would vie in interest with any other trip in the world.

Mr. George Horace Lorimer, editor of the Saturday Evening Post, during a tour of a number of the national parks, was thoroughly impressed with the need of saving the redwoods of California. In an editorial entitled "Selling scenery," of the issue of the Saturday Evening Post of October 11, 1919, he points out that the saving of the redwoods is as much a national matter as if Independence Hall or the Capitol at Washington needed saving from destruction. He concludes his editorial with the following paragraphs:

> It is natural and human that the men who put their money into these trees should want to coin them into grape stakes or into whatever else the local market wants. But there should be a big national market for standing redwoods. A little of that unrest we keep hearing about will not hurt if we are restless about the right things. Saving the redwoods is one of those things.
>
> Selling beauty is a dangerous business. But buying beauty and keeping it unspoiled to enjoy and pass on—that is a different matter. Why not endow a forest or a mountain or a canyon for the people, as well as a college?

By way of emphasis I mention again the necessity of preserving strips of redwood timber along the roads that California is building or will build to the northern section of the State. The same observation applies to roads now under construction in Oregon, or that will probably be undertaken. A strong effort is being made to plant trees along the transcontinental highways which will soon link up the various sections of the East with the West, and it certainly behooves us to preserve the trees along highways where they already exist.

I am leaving no stone unturned to secure the preservation of trees along approach roads to Mount Rainier and Yosemite National Parks and along the highways within Yosemite and Glacier Parks, where the roads traverse private holdings. There are, however, many problems connected with the safeguarding of the strips of trees necessary to preserve the sylvan beauty of these highways that are very difficult to solve, and in almost every case cooperation of agencies unconnected with the National Park Service is necessary. In certain projects the Forest Service will be able to help materially by making exchanges of timber along roadsides for merchantable timber in the near-by forests, but in other cases only the wholehearted, enthusiastic, interested aid of entirely unofficial organizations and individuals can help us meet the conditions confronting us.

The general offices of the Save the Redwoods League will be maintained at the University of California, Berkeley, Calif. Dr. J. C. Merriam, of that institution, is general secretary of the league.

THE SAND DUNES OF INDIANA.

Since the close of the war renewed interest has been taken in the idea of establishing a national park in the sand-dune area of northern Indiana. Individuals who know the dunes intimately and who have a true appreciation of their beauties, and societies of which

these lovers and users of the dunes are members, are preparing to arouse wide consideration of this park project. They realize that if steps are not taken soon to set apart a section of the dunes area as a national playground, it will be cut up and sold for commercial uses of one kind or another.

It will be recalled that in the autumn of 1916, pursuant to the request contained in a Senate resolution, we conducted a careful investigation of this sand-dune park proposal, holding hearings on the plan in Chicago and later publishing a comprehensive report on the findings. This report has been in constant demand, and the first edition has become exhausted. A new edition will soon be published for use in the forthcoming campaign to safeguard a portion of the dune area.

The people who are interested in this project understand clearly the policy of Congress relating to the purchase of land for national parks, and are not preparing to call upon the Government for funds to aid their enterprise. On the contrary, they expect to enlist the financial aid of unofficial bodies and of individuals in the purchase of as much of the dune region as possible.

I will be much interested in the progress of the movement to save a bit of the typical sand-dune landscape. It is entirely unique, and the region possesses, in addition to this, recreative advantages of national importance. The Lake Michigan beach, a part of the sand dune area, would alone furnish pleasure to hundreds of thousands in the summer season, while a tract of from 8,000 to 12,000 acres, including some of the woodlands, would offer opportunities for camping that could hardly be excelled in most of the big parks of the West.

I hope the movement may splendidly succeed.

MAMMOTH CAVE NATIONAL PARK PROPOSED.

In my last report I called attention to the advisability of placing in a national park the Mammoth Cave of Kentucky, and possibly the Great Onyx Cave, not far distant from it.

On May 26, 1919, Representative R. Y. Thomas, of Kentucky, introduced H. R. 3110, a bill "Establishing the Mammoth Cave National Park," but no action has been taken on the measure as yet. It proposes the outright purchase of the Mammoth Cave for national park purposes. I renew my observation of last year that this region is a worthy candidate for parkhood and that its acquisition should be seriously considered at this time. Whether it be purchased by Congress or whether it be acquired by private funds and donated to the Government, it ought soon to become the Nation's property.

EASTERN NATIONAL PARKS.

Any discussion of the sand dunes of Indiana or of the Mammoth Cave region of Kentucky as possible national parks raises the question of national parks in the East and the method of acquiring such areas. That there should be a group of parks in the eastern section of the country which would include the best examples of its varying landscape and some of its most wonderful natural features can not be denied. Not only is the East entitled to recognition of the im-

portance and value of these features by having placed upon them the stamp of superlative excellence which the national-park status conveys but the people of the Nation are entitled to have them selected, described, and developed for their benefit.

As to the means of acquiring parks in the East, Congress, as I have said, has never adopted a policy of purchasing lands for this purpose, but there seems to be a precedent for such action by its authorized purchase of national forest lands in the Appalachian Mountains in accordance with the provisions of the Weeks Act of March 1, 1911.[1] On the other hand, no more noble gifts could be made to the Nation by public-spirited individuals than tracts of land suitable for national parks or monuments.

GIFTS OF LANDS FOR EASTERN PARKS.

Such a gift was made when the lands that now form Lafayette National Park were conveyed to the Federal Government as a national monument—the Sieur de Monts National Monument, created July 8, 1916.

Again, the upper reaches of Grandfather Mountain, in North Carolina have been tendered to the Federal Government for park purposes, and authority has been granted by Congress for the acceptance of the tract.[2] An examination has been made of the area, and it has been finally determined that it is not susceptible of development as a national park.

In the will of the late Joseph Battell, of Middlebury, Vt., a devise of 4,000 acres of fine forest land in the Green Mountains was made to the United States for a national park. As yet it has not been possible to examine the land and determine whether or not it is worthy of acceptance for park purposes. Unless, of course, it fully complies with the high standards of our park policies with respect to new parks, we can not recommend to Congress that the lands be accepted under the terms of Mr. Battell's will.

THE NATIONAL MILITARY PARKS.

A further question that naturally arises in a discussion of eastern national parks relates to the national military and other parks under the control of the War Department. All of these parks are in the Eastern States, the one farthest west being Vicksburg National Military Park on the shores of the Mississippi. The others are Gettysburg in Pennsylvania, Chickamauga and Chattanooga in Tennessee and Georgia, Antietam in Maryland, Guilford Courthouse in North Carolina, and Lincoln's Birthplace in Kentucky.

Should they not belong to a general national park system and be under the jurisdiction of the National Park Service? With very few extensions of our administrative organization these parks could be cared for splendidly. It seems illogical that control of national park areas should be so divided. Certainly if it should be concentrated under one bureau the entire system could be better ad-

[1] 36 Stat., 961.

[2] Hereafter the Secretary of the Interior is authorized to accept for park purposes any lands or rights of way, including the Grandfather Mountain near or adjacent to the Government forest reserve in western North Carolina. Sundry civil act of June 12, 1917 (40 Stat., 152).

ministered. Furthermore, greater interest in the historic places of the Nation could be stimulated by promotive and travel literature issued in connection with the development of the scenic parks of the country.

CONSOLIDATE NATIONAL PARK AREAS UNDER ONE HEAD.

Reference is made to the chart opposite, which shows a still further division of control of our national park areas than I have yet mentioned. Besides the War Department control of the national military parks and Lincoln's Birthplace National Park there are 10 national monuments under the jurisdiction of the Department of Agriculture, all of which should be a part of a single national park and monument system. Likewise the two national monuments under the War Department should be a part of a unified system. It is to be hoped that Congress will remedy this illogical situation in the early future.

It is interesting to note that the Dominion of Canada not only had a national park bureau long before a similar organization was established here, but that our northern neighbor placed full control of all of her parks, scenic and historic, under this bureau regardless of where they were located or what prompted their creation.

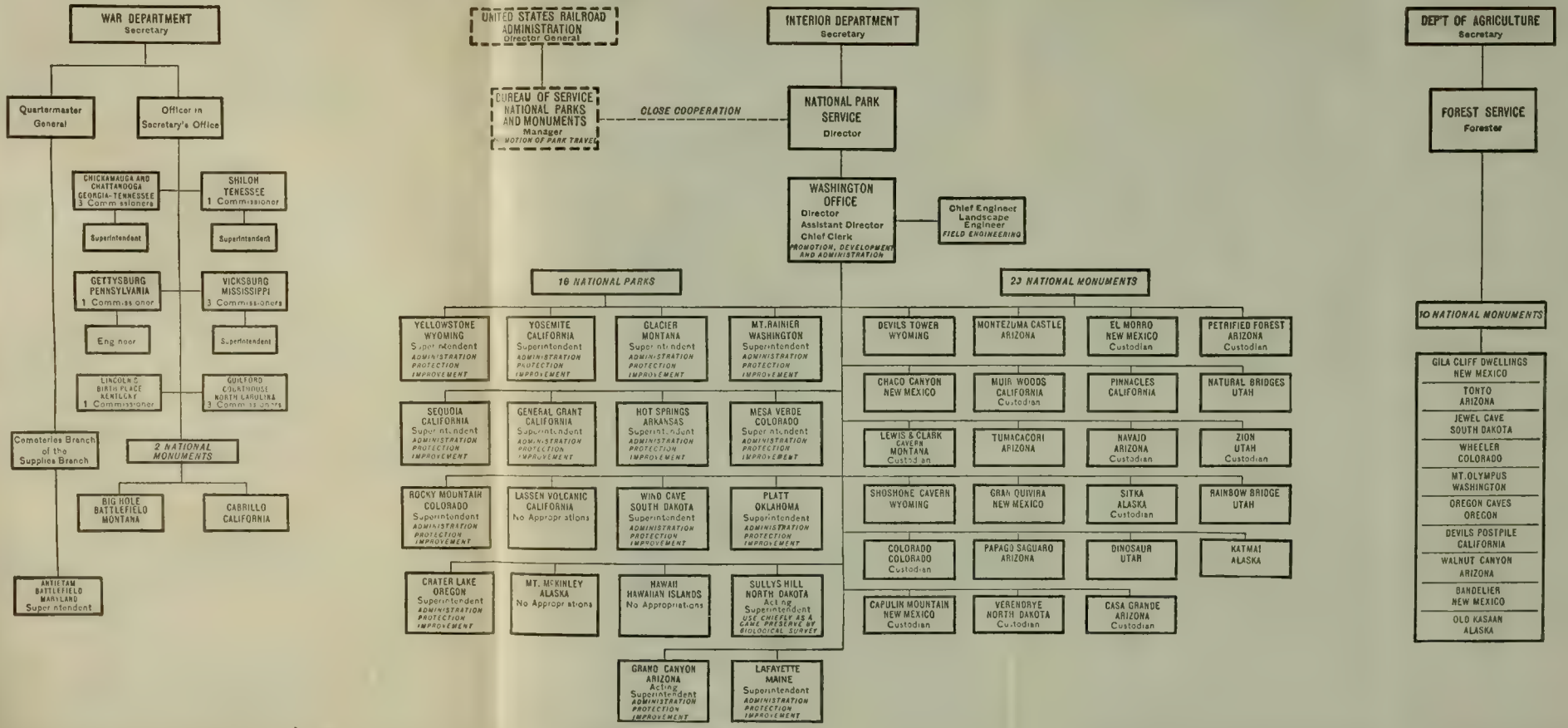
APPROPRIATIONS AND REVENUES.

Appropriations for the current fiscal year were small, only $754,195 having been made available for the entire park system, including the new Grand Canyon National Park, for which no appropriations have heretofore been made. Last year the total appropriations were $1,062,205, including $50,000 to be expended in Crater Lake National Park in the improvement of roads under the jurisdiction of the Army Engineers. It is fair to note, however, that last year $140,000, together with $50,000 from the revenues of the reservation, was made available for the construction of a new free bathhouse and administration building at Hot Springs Reservation, which, owing to war conditions, was not spent and was reappropriated for the current fiscal year in addition to the fund of $754,195 above mentioned.

Nevertheless, in view of the enormous travel to the national parks and the extraordinary wear and tear which the roads and trails and other improvements suffered, not to dwell upon the extra burdens of patrolling the national parks in a season when the fire hazard was unusually great, the appropriations were far too small. It is true they were made in accordance with estimates for the current fiscal year, but the estimates, at the request of the Committee on Appropriations, were placed on a "rock-bottom" basis in view of the prospective continuance of the war. The estimates contained no requests for new construction work, except for the completion of the El Portal Road in Yosemite National Park, and this was the only road improvement project that the appropriation act authorized for the year.

Due to the fact that our use of the revenues of the various parks, except Hot Springs Reservation, was prohibited by legislation in 1917, the funds earned in the operations of the parks could not be used to meet the need for more funds than were appropriated by the sundry civil act.

ADMINISTRATION OF NATIONAL PARK AREAS
1919



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Furthermore, Congress omitted to give us a special fire-fighting fund for the park system. The lack of this fund greatly handicapped our operation of Glacier and Yellowstone National Parks, where extensive fires broke out, compelling the use of road-maintenance funds in fighting the flames. Reimbursement of the appropriations of these parks is made in a pending deficiency bill, but this money comes too late to perform work that will benefit the traveling public. The season has long since closed.

I can not too strongly urge the necessity for providing a general fire-fighting fund for the national parks, to be available in any park where fires happen to occur. It will not only provide insurance against extensive injury to the parks but it will protect the road and other maintenance funds against depletion just at the time when they are needed most in the upkeep of the parks.

REVENUES INCREASING.

Despite the fact that travel in the national parks fell off during the season of 1918, the revenues decreased very slightly. This is particularly remarkable when we consider the fact that the biggest revenue producer, Yellowstone Park, suffered a very large decrease in visitors. The total revenues for the fiscal year ended June 30, 1918, were $217,230.55, while the receipts for the fiscal year ended June 30, 1919, were $196,703.03.

The current fiscal year, however, will produce more revenues than any previous year. On October 13, 1919, they had reached $171,303.12. This fund will undoubtedly reach $250,000 before the end of the fiscal year, or approximately one-third of the amount of the appropriations for the year. In Yellowstone and Mount Rainier National Parks the revenues will reach about 50 per cent of the appropriations.

If large appropriations should be made for a few years in order that the roads and trails of the parks might be extended and improved sufficiently to attract an enormous volume of travel to every park in the system, the revenues could be brought to a figure approximating the cost of the administration, maintenance, and protection of these reservations.

THE YEAR IN THE PARKS.

The following summary of conditions in the parks and monuments during the past year, their important needs, and our plans for their early future development and improvement is purposely made brief in view of the very comprehensive reports of the superintendents which have been printed in full in Appendix B.

YELLOWSTONE NATIONAL PARK.

Yellowstone, biggest and best known of all the national parks, has advanced with mighty strides during the past year. The action of Congress in granting to the National Park Service absolute control of the park's affairs, including its protection and improvement, is chiefly responsible for this progress, because it opened wide the door of opportunity to develop the park in harmony with the general poli-

cies of the department and under a permanent management. Much was expected of this unified control; and although the permanent organization is not yet complete, the new order of things has much more than justified its establishment. Its accomplishments, as observed by me on a recent trip through the park, were evident on every hand, and yet the intangible achievements connected with the operation of this great reservation in a season of enormous travel were certainly very much greater and more far-reaching in their influence than the physical improvements and evidences of efficient protection of the natural resources of the park that were to be seen on a tour of the park covering the ordinary routes of travel.

ADMINISTRATION OF THE PARK REORGANIZED.

On July 1, 1918, the law authorizing the withdrawal of the military forces engaged in protecting Yellowstone Park became effective, but the 1918 season came to an end and autumn was well advanced before the War Department could arrange for the abandonment of Fort Yellowstone. The old post was finally turned over to the National Park Service on October 31, 1918. The engineering work, however, was formally transferred to the Service with the beginning of the past fiscal year, the officer of the Corps of Engineers of the Army in charge, Maj. G. E. Verrill, having received orders to proceed to another post of duty. However, uncertain conditions governing every activity of our field service, due, of course, to the war, made it inadvisable to attempt the immediate organization of the permanent administration; hence our efforts to coordinate the various elements of control were confined to temporary measures. These continued in effect until the beginning of the present season.

ASSISTANT DIRECTOR ALBRIGHT BECOMES SUPERINTENDENT.

In June, 1919, the assistant director of the Service, Mr. Horace M. Albright, who had been my chief aid for over four years, and who had made a most comprehensive study of conditions in the Yellowstone region with a view to the future broad development of the park, was appointed as its chief executive. Mr. Albright assumed the duties of the superintendent's office on July 1. His long experience in dealing with the affairs of all the parks and his extensive traveling in all parts of the park system, in addition to his intimate knowledge of conditions in Yellowstone Park and his deep interest in its welfare, have particularly qualified him for his new office. Mr. Chester A. Lindsley, former chief clerk of the park, who efficiently guided the administrative affairs of the Yellowstone during the war emergency and the period of transition from military jurisdiction to the control of this bureau, has been appointed assistant superintendent.

Further organization of the permanent force of the park will proceed rapidly, and concurrently comprehensive measures will be proposed for the improvement of the park and the encouragement of its larger and more beneficial use by the people of the Nation.

ALL TRAVEL RECORDS BROKEN.

Yellowstone Park was toured this year by more people than ever visited it before in a single season. The travel record of 1915, the

"Exposition year," when 51,895 people visited the park, was broken shortly after the middle of August, and as this report is written the news comes to me that the total number of tourists entering the park this year will exceed 62,000. The average travel per season for the 10 years immediately preceding 1919 has been less than 29,000, and, excluding the record year 1915, the seasonal travel of the past decade has averaged about 26,000. This remarkable increase in travel considerably exceeded our highest estimate of the number of people who would visit the park this season, and no one will contend that the coming of this vast throng of tourists could have been foreseen. The travel by rail could probably have been predicted, but the largest portion of the total number of visitors came in automobiles from every State of the Union. It was the motorists that could not be estimated in advance of the season. As the travel tables in the superintendent's report in Appendix B will show 21,275 visitors came to the park by rail lines and 40,986 by privately owned means of conveyance—a truly remarkable record considering the present limitations on travel promotion by railroads, the motor travel of the past years, and the fact that Yellowstone Park is remote from large cities and in a relatively sparsely settled region.

HOTELS AND PERMANENT CAMPS SOMETIMES OVERCROWDED.

The absence of any facts upon which an estimate of travel to the Yellowstone could be based made it impossible to ascertain what accommodations ought to be provided for the season's business. It appeared in the early spring that it would not be necessary to open the hotel and camp at Yellowstone Lake, nor did it seem advisable to do this, because the hotel required certain important repairs and the camp had to be rebuilt. Later, when the prospects for heavy travel improved, it was too late to employ necessary assistance to improve the plants and operate them. The result of this curtailment of accommodations was an overcrowding of the hotel and permanent camp at the Grand Canyon of the Yellowstone at the period of heaviest travel. This shortage of sleeping quarters, however, only became serious in times of storm, when hundreds of motorists camping in the park sought the shelter of hotels and camps more substantial than their own. These occasions were few, however.

MORE ACCOMMODATIONS AVAILABLE IN 1920.

Work has already been undertaken in the hotel and camp at Yellowstone Lake, and next year these plants will be operated to their fullest capacity. The camp at Tower Falls, known as Camp Roosevelt, in commemoration of the late ex-President's visit in 1903, will be greatly expanded and improved before the opening of next season. Thus there will be four large hotels and five permanent camps available for the public next year. The Fountain Hotel, abandoned in 1917, when the transportation of the park was motorized, is in a state of dilapidation that probably places it beyond repair.

It was only a few years ago that Yellowstone Park seemed equipped with hotel accommodations beyond even her future needs. Now, it is clear that very shortly all of her hotel and permanent camp establishments must be expanded enormously and at large expense. It will be

our policy to require expansion of these plants each year to an extent consistent with the maintenance of good service to the public.

In May, 1919, Howard H. Hays, formerly manager of the Bureau of Service: National Parks and Monuments, of the United States Railroad Administration, purchased the property and franchises of the Yellowstone Park Camping Co. He brings to the park a splendid enthusiasm and confidence in the recreational and educational advantages of the Yellowstone region, which, combined with his knowledge of conditions in all of the parks of the system gained in his railroad experience, make his business connection with the Service particularly helpful.

MOTORISTS CAMP OUT IN THE YELLOWSTONE.

More interesting to me than the fact that over 62,000 people visited the Yellowstone this season is the report of the superintendent that nearly half of the tourists camped out, using equipment and supplies brought with them in many instances from States as far distant as the Atlantic seaboard. Not a few of the cars outfitted for camping were large and costly. During the greater part of the season from 5,000 to 6,000 people were enjoying motor trips over the road system each day, while night found them sitting around hundreds of camp fires or forming the throngs at the hotels and camps.

The private camping outfit of the motorist has gained for the Yellowstone widespread recognition of its great resort possibilities. The public is coming to the full realization of the fact that this is a scenic and recreative park of the first order, as well as a wonderland of nature's curiosities. The beauties of its mountains, lakes, waterfalls, canyons, and forests are gripping the traveler with the same power that has long been exercised by the geysers, hot springs, fossil forests, and similar features. He is enjoying a new Yellowstone.

BIG AUTOMOBILE CAMP GROUNDS NECESSARY.

The use of the park by motorists bringing their own camp outfits has clearly demonstrated this year that we must develop the automobile camp on a very comprehensive scale. Plans already outlined by the landscape engineer of the service and the superintendent call for the improvement and maintenance of over 50 large camp grounds reasonably adjacent to the park roads. The most important grounds will be made available for next season's use. Water will be piped from streams and lakes known to be free from pollution of any kind, comfort stations will be built, and cooking grates will be provided. As all of the wood in the vicinity of the camp grounds was utilized this year, fuel must be sawed for each new camp before the opening of the new season. Camps of this kind, but on a small scale, have been maintained at the principal points of interest in the park for several years, but they were wholly inadequate to accommodate even a small proportion of the motor parties of the past summer.

THE CHARM OF YELLOWSTONE TRAILS.

Many people who visited the park in the days of the stagecoach declare that it has lost much of its romance and charm, that it seems less wild. They recognize that the regular tour of the park is more

A. THE MOUNTAINEERS IN PARADISE VALLEY, DECEMBER, 1918.

Photograph by H. W. Gleason.

B. THE WINTER APPROACH TO THE MOUNTAIN.

DEVELOPMENT OF WINTER SPORTS.

MOUNT RAINIER NATIONAL PARK.

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Photograph by United States Reclamation Service.

A. JACKSON LAKE AND THE TETON MOUNTAINS IN THE PROPOSED ENLARGEMENT.

Grand Teton, elevation 13,747 feet, on the left, and Mount Moran, elevation 12,100 feet, on the right. The elevation of Jackson Lake is 6,700 feet.

Photograph by National Park Service.

B. AUTOMOBILE CAMPERS BELOW MAMMOTH HOT SPRINGS TERRACES.

YELLOWSTONE NATIONAL PARK.

A. SHOWING OLD ROAD AT RIGHT.

B. OF EASY GRADE AND AMPLE WIDTH.

NEW GARDINER ROAD, YELLOWSTONE NATIONAL PARK.

Photographs by J. E. Haynes.

A. SCENE IN PROPOSED ENLARGEMENT.

Looking across Diamond Lake toward Mount Bailey, elevation 8,356 feet.

B. DAY'S CATCH OF LAKE TROUT.

CRATER LAKE NATIONAL PARK.

Photographs by National Park Service.

comfortable and generally more satisfactory, because of the greater amount of time that the visitor has to spend in seeing the most remarkable features of the park, but they experience a longing for the stillness of the forests and peculiar fascination of the park in the stagecoach days. It was inevitable that the automobile should revolutionize the park tour, just as it changed travel conditions everywhere and turned into memories cherished methods of seeing and doing things. However, the old atmosphere of the Yellowstone is still to be enjoyed, not perhaps on the roads, but certainly only a few hundred yards distant, where the trails take their winding course through the forests. Wild animals are abundant along the trails, and the wild flowers grow in greatest profusion. No wildness has been lost from these trails; no charm of the old West has vanished. The trails should be used, and I am happy to state that a considerable number of parties came through the park with pack trains this season. More are coming next season. Some of these trail parties, among them one headed by former Secretary of the Interior Walter L. Fisher, saw nearly every species of wild animal that inhabits the park, including the wild bison of the upper reaches of the Lamar River and the moose of the Upper Yellowstone.

MORE TRAILS NEEDED.

There are more than 300 miles of tourist trails in the park, and over 200 miles of fire lanes and patrol routes. Some of these trails need repair, and the system should be extended, especially in the Absarokas and east and south of Yellowstone Lake, the wildest section of this great reservation. It is particularly necessary that a trail be built around the arms of Yellowstone Lake connecting Heart Lake and the Upper Yellowstone River. Trails over Jones Pass and Eagle Pass into the Shoshone country should be built soon, and everywhere that a trail does not parallel a road one should be constructed, because riding horses along motor roads is both unpleasant and unsafe.

It is altogether likely that when the park is extended to include the headwaters of the Yellowstone, Pacific Creek, and the Teton Mountains the trail system can be so extended as to make it the equal of any mountain trail system in existence.

PARK EXTENSION BILL IN CONGRESS.

In the annual reports for 1917 and 1918 we urged the enlargement of Yellowstone Park by the addition of the Teton Mountain region, the country north of the Buffalo Fork of the Snake River, and the territory at the headwaters of the Yellowstone River. The Mondell bill,[1] H. R. 13350, of the Sixty-fifth Congress, passed the House of Representatives on February 17, 1919, but when it came up in the Senate an objection was interposed to its passage. The difficulties that prompted the objection were later explained satisfactorily, but in the rush of business at the close of the session there was no other opportunity for consideration of the measure. Early in the Sixty-sixth Congress Mr. Mondell introduced H. R.

[1] See p. 1233 for committee report on H. R. 13350, containing favorable reports of both the Department of the Interior and the Department of Agriculture.

1412, similar to the bill of the previous session, and this legislation is now pending.

Some opposition has developed against this project, but much of it is caused by a misunderstanding of the terms of the bill. On the other hand, a few of the opponents are seeking grazing privileges in the extension area, especially in the Buffalo Fork region. All existing rights and privileges enjoyed in the country proposed for addition to the park are fully protected in the Mondell bill. Practically all of the territory is within the boundaries of a State game preserve. All of it is in a forest reserve at the present time. It belongs absolutely to the Federal Government. Both the Interior Department and the Department of Agriculture have indorsed the extension plan, and there seems to be no good reason why the project should not be adopted except that the Buffalo Fork region might be needed for the pasturage of cattle. The Biological Survey, officers of the Forest Service, and others who have studied the problem of the southern herd of elk declare that this Buffalo Fork territory is needed for summer range for the elk. If this is the situation, it must always serve this purpose and ought to be put in the park. Every precaution must be taken henceforth to protect this elk herd regardless of demands for increased grazing privileges.

So far as its utilization is concerned, the extension area is almost in a park status at the present time. When placed in the park its trails and roads would be repaired and extended, but in other respects it would be maintained in its present state. By special authority of Congress, approximately 30 miles of roads in this region are now maintained by the National Park Service.[1]

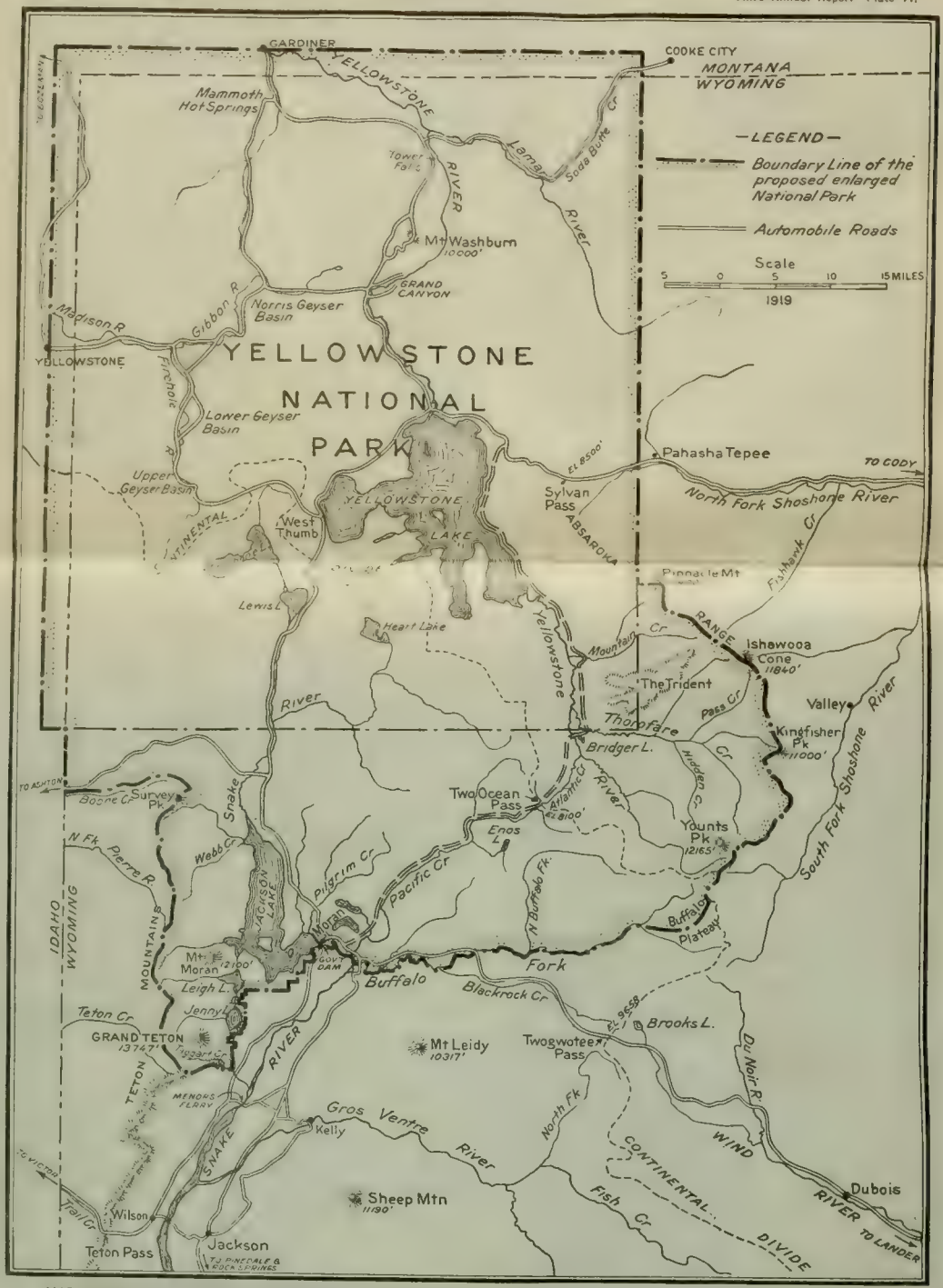
THE TETONS VALUABLE ONLY FOR PARK PURPOSES.

The Teton Mountains and the headwaters of the Yellowstone River can never be put to any commercial use. There should be no question about their preservation forever in a state of nature as a part of the park. These magnificent Tetons are each year becoming better known, and already hundreds of tourists have claimed them for the park. Naturally belonging to the park, they should be formally added at the earliest practicable date, in order that immediate steps may be taken to render them more accessible to Yellowstone visitors. The statement of any other merits of this project would merely be a reiteration of arguments of my last report, and the reasons set forth in the House report on the extension bill already referred to in the footnote.

THE MENACE OF IRRIGATION PROJECTS.

Since the close of the war, certain irrigation works have been projected which contemplate the use of waters of Yellowstone Park. I am not advised as to the details of these projects, but they comprehend plans for the utilization of Yellowstone, Lewis, Shoshone, and Heart Lakes and the Falls River Basin as storage reservoirs. With possibly one exception, all of these plans propose the construction of dams, the raising of the water levels of the lakes, and the flooding of timbered land along the lake shores. In the case of the Falls River project, a vast area of forested parks and marshes

[1] See sundry civil act of July 19, 1919, on p. 1218.



MAP SHOWING PROPOSED ENLARGEMENT OF YELLOWSTONE NATIONAL PARK AND DEVELOPMENT OF SOUTHERN ENTRANCE.

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would be flooded, thus ruining what is probably the best range for moose in the park. Approximately 600 moose thrive in this region at the present time.

Frankly admitting lack of knowledge of what these projects would accomplish, I contend that there can be no utilization of the lakes of the park, or of the Falls River Basin for irrigation that will not bring with it desecration of the people's playground for the benefit of a few individuals or corporations. All of the lakes of the park are in heavily timbered districts. Great forests reach down to the water's edge. In some parts of the park, level tracts of land embracing thousands of acres lie at an elevation of only a few feet above these lake shores. Raising these lakes would kill millions of feet of timber, wipe out miles of roads and trails, and create a scene of chaos and destruction that would be an eyesore for a thousand years.

Is there not some place in this great Nation of ours where lakes can be preserved in their natural state; where we and all generations to follow us can enjoy the beauty and charm of mountain waters in the midst of primeval forests? The country is large enough to spare a few such lakes and beauty spots. The Nation has wisely set apart a few national parks where a state of nature is to be preserved. If the lakes and forests of these parks can not be spared from the hand of commercialism, what hope can we entertain for the preservation of any scenic features of the mountains in the interest of posterity?

Yellowstone Park has been established for nearly half a century. Every plan to exploit it for private gain has failed to receive the consideration of Congress. Mighty railroad projects have even gone down to everlasting defeat. Must all the victories of the past now become hollow memories by the granting of reservoir rights that will desecrate its biggest and most beautiful lakes, and form the precedent for commercial exploitation of all of its scenic resources—its waterfalls, its forests, its herds of wild animals, its mineral waters? It is to be hoped that the projects now being developed will meet the fate of the others that have come before Congress in the past.

THE ELK HERDS IN DANGER.

While the wild animals of the park, with the exception of the bison, have been in excellent condition during the past year, last winter having been mild in the extreme, the drouth of the summer has so injured the fall and winter range in the park and in the adjoining forests that the outlook for next winter for several species of big game, especially the elk and antelope, is anything but promising. In anticipation of a long cold winter we have made all possible arrangements for caring for these animals. Considerably more than 1,000 tons of hay and other forage is now available for feeding, and these stocks would be further increased if we had more funds. This forage will be used in the northern section of the park. For the southern herd of elk, a large portion of which moves into the lower Jackson Hole in winter, the Biological Survey has made available at its ranch near Jackson a very large supply of hay. In

this enterprise the State of Wyoming has materially assisted. However, the southern herds of elk, like the northern herds, will undoubtedly suffer from depleted fall and winter range, as a result of the drouth. Finding these ranges in a sun-burned condition, it is not unlikely that the elk herds will continue to move down from the mountains and out of the park and game preserves, thus escaping from the control of their protectors before the winter sets in. Thus we are confronted with a dangerous situation, which may produce the great calamity that is to be expected to befall the elk some time unless adequate winter feeding grounds, both north and south of the park, are procured.

WINTER FEEDING GROUNDS NECESSARY.

There are many steps to be taken in a program that will absolutely insure the perpetuation of the elk herds. Most of these measures relate to adjustments of one kind or another in the use of the adjacent forest reserves, but the all-important feature of the program is the purchase of lands in the valley of the Yellowstone north of the park for the cultivation of hay for the northern herds of elk and for the establishment of a feeding ground for use in severe winters when the elk leave the park, and the purchase of additional land in the Flat Creek Basin of the Jackson Hole to greatly enlarge the Biological Survey elk farm for the winter care of the southern herds. It will require several hundred thousand dollars to carry out this program, but it is worthy of the consideration of every public-spirited individual and society of the Nation.

In the safeguarding of elk herds the enlargement of the park, as already discussed, is a factor of great importance, because much of the territory involved in the extension is used by the southern elk bands as a summer range, and a portion of it is the winter home of a considerable number of elk.

EPIDEMIC AMONG THE BISON.

In February of this year an epidemic of hemorrhagic septicemia in the herd of tame bison ranging at the big farm in the Lamar River Valley resulted in the death of 36 animals. The cause of the epidemic has not been definitely determined. The bison will be vaccinated hereafter as a protection against the disease, and no further trouble of this kind is anticipated.

There are now 413 in the herd of tame bison, including 85 calves born this year. The wild-bison herd ranges on the headwaters of the Lamar River and is now composed of about 90 animals. It has been seen by several trail parties this summer, as well as by the rangers who know its haunts in the mountain fastnesses.

NEW TELEPHONE AND TELEGRAPH LINES NEEDED.

In the protection of this great park from fire and in the dispatch of the public business, an excellent telephone system is an essential utility. Such a system has never been installed. The existing lines are not adequate to meet the ordinary requirements of the daily routine business, not to mention emergency calls. It is used by the

Yellowstone Park Camping Co. and by the touring public, as well as by the Government. Maintenance costs are excessive, due to the fact that much of the material and equipment are old. The poles cut in the park are good for only a few years. These statements about the condition of our lines hold for the other telephone system, which is owned and operated by the Yellowstone Park Hotel Co. Both lines should be rebuilt, and I earnestly recommend that a modern metallic circuit system be installed by the Government with sufficient wires and equipment to meet all demands of the park and of its business interests, the Yellowstone Park Hotel Co. being duly reimbursed for the value of any of its equipment that may be useful in the new system.

The hotel company also operates the telegraph system of the park, but I think this should also be taken over by the Government and operated as in Yosemite National Park. Not only would better service be rendered in connection with the complete control of all wire lines, but such service could be rendered at less cost to the public.

As a general proposition, the telephone and telegraph lines of all national parks should be operated by the Government or in connection with commercial companies where such corporations have established their lines in a park area before its dedication for park purposes.

ROAD SYSTEM IN FINE REPAIR.

Although the very dry season made it extremely difficult to maintain the roads of the Yellowstone in good condition for travel, this result was attained, and when I visited the park early in September I found the highways in an excellent state of repair. In fact, I have never seen them in better condition.

The tremendous increase in travel to the park, and the prospects of further enormous increase in the use of automobiles on the roads, will make necessary the undertaking of some rather extensive improvements in the way of widening certain sections, renewal of bridges and culverts, construction of parapets, etc. The Firehole cut-off should be completed, and the old road along Yellowstone Lake from the Thumb region to Bridge Bay near the Lake Hotel should be restored.

Next year the road in the northwestern section of the park connecting with the highway through the splendid colored canyon of the Gallatin River—the approach to the park from Bozeman—should be widened and improved, and the year following, as this reconstruction of the Gallatin Canyon road nears completion, the section of this highway from Grayling Creek to Yellowstone, Mont., at the western entrance, now outside of the park, should be relocated within the park boundaries and entirely rebuilt.

APPROACH-ROAD PROBLEMS.

The east and south approach roads to the park, running through adjacent forest reserves, require considerable permanent improvement including, in the case of the east or Cody approach highway, the installation of several new bridges.

The performance of such work outside of the park on strictly tourist highways is certainly a proper field for Federal assistance.

Similar aid is desired by Montana authorities in the upkeep of a portion of the northern approach road from Livingston to Gardiner at the north gateway. This highway is used to considerable extent by residents of the Yellowstone Valley north of the park and, because of this use, Montana should bear a very substantial portion of the burden of maintaining this road. On the other hand, its local use is exceeded greatly by the travel of Yellowstone Park tourists, and, for this reason, the Federal Government should undoubtedly either take over the upper or southern third or half of the road or contribute generously to the State in aid of its improvement work on the highway.

RANGER STATIONS AND SNOWSHOE CABINS.

The buildings of Yellowstone Park, except at Mammoth Hot Springs and in a few other sections of this great reservation, are sadly in need of repair or reconstruction. Most of the ranger stations were built many years ago for the summer housing of troop detachments. They are not fitted for the use of rangers, and several of them are in such a dilapidated condition that it would be false economy to repair them instead of constructing new buildings.

It is particularly necessary to build new ranger stations and information offices in connection therewith at Upper Geyser Basin, Yellowstone Lake, and Grand Canyon, the three great centers of tourist interest aside from Mammoth Hot Springs. These should be built next year.

Likewise the snowshoe cabins of the park, which are constantly used in the dead of winter by patrolling rangers, ought to be rebuilt and refurnished. They are old, in bad repair, poorly located, and unsatisfactory from every standpoint. The ranger force of every park, considering the nature of its work, should have dry, sanitary quarters, and, in winter, the means of overcoming the effects of exposure while on long patrols in below-zero weather. Such quarters are few in the Yellowstone, where the weather conditions are more severe in winter than in any other member of the system. This is frankly an appeal in the interest of humanity.

GLACIER NATIONAL PARK.

So far as tourist travel is concerned Glacier National Park had a most successful year, but in some other respects the season was disappointing and unsatisfactory. The underlying cause of the incomplete success of all features of the operation of the park was the lack of rain, which caused the forests to become veritable tinder boxes, and made it particularly difficult to maintain the roads and trails in good condition. Forest fires were started by lightning or by careless campers and raged furiously in different sections of the park, sometimes six or eight burning at one time, and fire followed fire for nearly two months. Scarcity of labor, due to unprecedented demands for fire fighters in the national forests of the State, made it unusually difficult to get the park flames under control or to keep them in hand when partly subdued. The lack of available men, of course, made it necessary to utilize road and trail crews in the fighting of fires. Thus it was quite impracticable to make any satisfactory progress in the maintenance or improvement of the park.

DROUGHT AND FIRES STOP IMPROVEMENTS.

The lack of a general fire-fighting fund was a further serious obstacle to meeting the emergencies with which the park was confronted. Funds for protection and improvement of the park had to be diverted to the fighting of the fires. This so reduced the available funds that when the fires were all under control it was impossible to begin road and trail repair where the interruption of this work had taken place. At this writing the deficiency appropriation bill carrying funds to reimburse the regular appropriations for the park has not yet been enacted into law. Consequently a very small amount of improvement work was accomplished in the park this year.

The only fire which seriously marred the beauty of the park originated in the Dry Fork of the Two Medicine River and, fanned by terrific winds, swept down to the main valley. Fortunately it did not reach the heavily wooded section about Running Eagle (formerly Trick) Falls, nor did it proceed up the Two Medicine Valley toward the chalet system of the Glacier Park Hotel Co. An area of 3,000 acres in the park and a larger area around Lower Two Medicine Lake in the Blackfeet Indian Reservation were burned over.

SMOKE DIMS MOUNTAINS AND GLACIERS.

At no time was any of the main hotels of the park in the path of a forest fire, and with the exception of the Two Medicine group not a chalet system was ever in the slightest danger, yet whenever the smoke concentrated in certain sections of the park, which it did occasionally, and the mountains were obscured, wild rumors of danger were often spread by excited employees of the business enterprises of the park and by tourists themselves, sometimes with the result that vacations would be cut short by precipitate departure from the park region. Also there were visitors with only a few days to spend in the park who were unfortunate enough to arrive just when smoke conditions were exceptionally bad and they had to leave again before the pall lifted.

While these conditions were annoying in the extreme and caused real hardship in many cases, the majority of the people who visited Glacier National Park this season had most delightful trips.

LONG VACATIONS AS USUAL.

In recent years there has been a growing tendency on the part of Glacier Park visitors to spend longer and longer vacations at the hotels and chalets or on camping trips in the more remote sections of the park. This year the desire on the part of tourists to spend a long period of time in the park was even more general than has been evident in previous seasons.

Many more extensive camping trips were enjoyed in the park this year than ever before. Some of the parties that went into the mountains for long trail trips engaged unusually large outfits, and on two occasions there were so many of these parties on the trails that the shortage of saddle horses became acute.

SADDLE HORSES IN GREAT DEMAND.

Considering the extraordinary demand for saddle horses, and especially the demand for elaborate camping outfits, the business was handled in a satisfactory manner by the Park Saddle Horse Co.; in fact, better saddle-horse service was rendered this season than at any time since the creation of the park. The horses were generally in good condition and were well cared for. I do not mean to convey the impression that there is not room for greater improvement in this service, because it requires considerable development before it will be in a position to meet every unusual or emergency demand made upon it. I do, however, regard its progress as worthy of commendation, and the enterprise is certainly entitled to the continuance of the protection afforded it by the Federal Government. With more horses available for quick transfer to the park in times of emergency and with certain essential changes in its organization the company may be expected to give entirely adequate service through the next season.

TRIANGLE TRIP POPULAR.

As was expected, the triangle trip established near the end of the season of 1918 was exceedingly popular this year. It gives the tourist a saddle-horse trip of three days' duration, in the course of which three passes are crossed, Swiftcurrent, Logan, and Piegan. The first two mentioned are trail crossings of the Continental Divide.

There is great economy in the operation of a "triangle trip" in Glacier Park, both from the standpoint of the tourist and the saddle-horse owners. It gives the visitor three days on the trails at a very reasonable cost, and enables him to cover a comparatively large area of the park without getting too far away from his baggage. Also, it obviates the necessity of deadheading animals over the trails, and this again is in favor of the park administration, because horses without riders when being driven over the trails damage them extensively in the course of a season.

More triangle tours are needed, and the next one to be developed will probably include a section of the beautiful Belly River country north of the Swiftcurrent alley, which is soon to be opened. Such a trip will cover a trail from Many Glacier Hotel on Lake McDermott by way of Appekuny Mountain and Red Gap to the Belly River region, thence to Granite Park Chalets, crossing the Continental Divide through Ahern Pass. The third leg of the tour would be the trail through Swiftcurrent Pass to the point of beginning.

Another trip similar to this can be developed as soon as there are accommodations in the Red Eagle Valley for tourists. A trail from the upper Red Eagle region skirting Almost-a-Dog Mountain, thence via Virginia Falls to St. Mary Lake and Going-to-the-Sun Chalets would complete the triangle, two sides of which, from St. Mary Chalets to Going-to-the-Sun Chalets and to the Red Eagle region, respectively, are already available.

NORTH PARK TRAILS PLANNED.

Naturally, the opportunities for opening triangle tours are quite limited, but there must be continual construction of trails of all kinds

and in all directions to keep pace with the growing interest in the remote sections of the park and the unopened beauty spots near the hotels and chalets that have already been established.

Tourists are becoming more and more desirous of seeing the northern valleys of the park, which have been only partially opened by trail construction. Particularly is it necessary to open the Belly River region with a shorter trail from Many Glacier Hotel. This can be built through Red Gap, and is now being surveyed, blazed, and roughly opened, with a view to early completion of construction work next season. The only trail into this region has skirted Chief Mountain and entered the Belly River region via Table Mountain.

Then, the Belly River country should be connected with Waterton Lake by a trail through Indian Pass. Appropriations for this trail are requested in our estimates for next year, as is another much-needed trail in the northern part of the park, connecting Browns Pass with Upper Kintla Lake via Hole-in-the-Wall Falls, it now being necessary to go through Canada in order to reach Kintla Lakes from Waterton Lakes or the Belly River region. This trail should be built next year, not only for the benefit of the tourist but as an aid to effective administration of the park.

In fully developing the Belly River district, which now becomes most desirable, if not essential, other trails should be built to Margaret Lake, Sue Lake, Mount Cleveland Basin, and other near-by points of interest.

Other essential trails include a connection between the Sexton Glacier trail and the Piegan Pass trail via Preston Park and a trail to Hidden Lakes from the Logan Pass trail, also a trail via Midvale Creek from Glacier Park Hotel to the Two Medicine region.

WALKING TRAILS PROPOSED.

No less important than extension of the horse-trail system is the construction of walking trails in Glacier Park, especially paths leading in various directions from the hotels and chalets to near-by points of interest. Trails of this type that must be constructed at once will lead to the summits of Mount Allen and Mount Altyn from Many Glacier Hotel; to the summits of Mount Brown and Mount Stanton from Glacier Hotel, on Lake McDonald; to Roes Basin and Goat Mountain from Going-to-the-Sun Chalets; and to Mount Jackson from Sperry Chalets. In order to protect the park from poaching, additional border patrol trails are needed along the southern and western park boundaries.

A COMPREHENSIVE ROAD PROGRAM.

I have discussed the trail needs of the park in advance of the roads, because the park is essentially a trail park now and must necessarily continue as such for a few years until our road program can be at least partly executed. Trails, too, are the forerunners of the roads, and it is probable that no complete road program for this park will ever be finally adopted until the trail system is entirely complete.

However, we now have a definite road-construction program ready to be undertaken as soon as money is appropriated for this purpose.

The survey for a transmountain road, undertaken last year, resulted in finding a perfectly practicable route through Logan Pass. The line as located provides for a road a little less than 50 miles in length, starting at the foot of Lake McDonald. The route is along the east side to the head of the lake, then up the beautiful McDonald Creek Valley to Trapper Creek, along Trapper Creek where it flanks the sides of magnificent Mount Cannon, thence over Logan Pass, through the Hanging Gardens, down Reynolds Creek, skirting the base of Going-to-the-Sun Mountain and along the north shore of Upper St. Mary Lake to Going-to-the-Sun Chalet, thence along the north shore and foot of St. Mary Lake to a junction with the Blackfeet Highway at St. Mary Chalet. It is doubtful if any other road in America can in the same distance unfold to the traveler such a grand array of beautiful and inspiring scenery, comprising large lakes, beautiful forests, dashing mountain torrents, wonderful gorges and valleys, towering cirques, a hundred waterfalls, glaciers, and a vista of bold needle-peaked mountains and serrated escarpments which are found only in our most northern Rocky Mountains, as will this road. This project has been completely developed by the engineering division, and it is proposed to begin the construction of the first unit of the highway next year. This will be the section on the east side of Lake McDonald from the Belton Highway to the head of the lake. It is estimated that it will require three to five years to complete this road.

Another road that should be built next season is the new road into the Lower Two Medicine region, which becomes necessary on account of the contemplated raising of the waters of Lower Two Medicine Lake for irrigation purposes. When the lake is raised it will cover the existing road. The new highway will be built on the north side of the river and along the ridge from the main Glacier Park-Many Glacier Highway to a point on the present road above the north shore of the lake.

A third highway included in our plans for next year's improvement will be built in the Belly River district between the international boundary and the junction of the south and middle of the forks of the river below Glenns Lakes.

ROADS OF THE FUTURE.

Other roads of the early future include an extension of the Cutbank Road some 6 miles nearer the head of the valley to the site of a new chalet group; the construction of a road up the Red Eagle Valley; a road along the shore of Lakes Josephine and Grinnell and probably up to Morning Eagle Falls; and a cut-off highway from Babb to the Belly River region by way of Sherburne Peak and Chief Mountain.

All of these roads can be constructed at a relatively low cost per mile as compared with ordinary mountain road costs, but because of the short working season, shortage of funds, and large mileage, it will require several years to carry out the program. Until many of these roads are built large automobile travel can hardly be expected. At the present time there is little for the motorist to do with his car, and when he wishes to go from one side of the park to

the other he must ship it by rail or drive several hundred miles to the southward in order to effect a crossing of the Rockies.

Although shipping an automobile across the mountain at a cost of $12.50, which is the rate charged by the railroad, is less than the probable cost of driving even a small car across the Continental Divide, the fact that railway shipment is necessary deters most motorists that contemplate transcontinental or transmountain trips from touring by way of Glacier Park. It is thought that when our transmountain highway is completed the touring automobile travel to Glacier Park will approach if not equal that of Yellowstone.

STATE HIGHWAY CONSTRUCTION.

In my report of last year I mentioned the proposed highway to be built through Marias Pass following the line of the railroad. Lack of funds has delayed this project, and little work was accomplished this year. A contract has been let for the building of the road to the pass from the east side of the mountains, this work to be done under a cooperative agreement between State agencies and the Forest Service. This will leave the larger portion to be finished later. This project is exceedingly meritorious and will be a great convenience to Glacier Park tourists as well as to the National Park Service, aside from its great commercial advantage to the State of Montana. As the road traverses Government lands throughout its entire course it would seem especially worthy of a large measure of Federal assistance in its construction.

The State has continued to give some aid in the maintenance of the road up the North Fork of the Flathead River in the park, but this is a highway that should be greatly improved by us. It makes a very beautiful lake region accessible and if put in good condition for automobiles would greatly extend the motoring advantages of the park.

INDIAN RESERVATION ROADS.

As I have stated in another part of this report, the approach roads to the park across the Blackfeet Indian Reservation are not in proper condition for automobile travel, especially the roads east of the agency headquarters at Browning and north of Babb to the international boundary. The road between Browning and the park highway system has been recently repaired.

These reservation roads in their present condition are a distinct discouragement to motor travelers, and this season have been the cause of much criticism of the park-to-park highway between Yellowstone and Glacier Parks and the Canadian park system. They should be repaired at the earliest opportunity.

While visiting Glacier Park on its interpark tour, members of the Brooklyn Eagle party subscribed over $1,100 for the repair of the road between Babb and the Canadian line in order to give our park system a connection with the excellent highways of Alberta, and thus make travel between Glacier Park and Banff, in the Rocky Mountains Park, Canada, safe and comfortable. In recognition of this generous act, the people of Montana and Alberta have called this particular highway "The Brooklyn Eagle Trail."

PUBLIC CAMP FOR BELLY RIVER.

The Belly River region is known to but relatively few people, but all who have seen it declare it to be one of the most beautiful mountian areas in the entire national park system. It has been formed by nature on a grander scale than the valleys of the park now accessible by the roads and generally traveled trails, and has a variety of charms that further distinguish it. Robert Sterling Yard, who visited this region two years ago, describes it in his "Book of the National Parks" as follows:

To realize the growing bigness of the land northward one has only to cross the wall from Iceberg Lake into the Belly River Canyon. "Only," indeed! In 1917 it took us 40 miles of detour outside the park, even under the shadow of Chief Mountain, to cross the wall from Iceberg Lake, the west-side precipice of which is steeper even than the east. The Belly River drainage basin is itself bigger, and its mountains bulk in proportion. Eighteen glaciers contribute to the making of perhaps as many lakes. The yellow mountains of its northern slopes invade Canada. The borders of its principal valley are two monster mountains, Cleveland, the greatest in the park for mass and height and intricate outline; the other, Merritt, in some respects the most interesting of Glacier's abundant collection of majestic peaks.

There are three valleys. The North Fork finds its way quickly into Canada. The Middle Fork rises in a group of glaciers high under the continental divide and descends four giant steps, a lake upon each step, to two greater lakes of noble aspect in the valley bottom. The South Fork emerges from Helen Lake deep in the gulf below Ahern Glacier across the Garden Wall from Iceberg Lake. Between the Middle and South Forks Mount Merritt rises 9,944 feet in altitude, minareted like a medieval fort and hollow as a bowl, its gaping chasm hung with glaciers.

This is the valley of abundance. The waters are large, their trout many and vigorous; the bottoms are extravagantly rich in grasses and flowers; the forests are heavy and full bodied; there is no open place, even miles beyond its boundaries, which does not offer views of extraordinary nobility. Every man who enters it becomes enthusiastically prophetic of its future.

I dwell upon the Belly valleys because their size, magnificence, and accessibility suggest a future of public use; nothing would be easier, for instance, than a road from Babb to join the road already in from Canada. The name naturally arouses curiosity. Why Belly? Was it not the Anglo-Saxon frontierman's pronunciation of the Frenchman's original Belle? The river, remember, is mainly Canadian. Surely in all its forks and tributaries it was and is the Beautiful River.

The Belly River is to be opened to the public next year. The trail connecting it with Many Glacier Hotel is already under construction. Early next season the Glacier Park Hotel Co. will open a camp in one of its most beautiful spots, and regular trips will be made between this camp and the big hotel. Furthermore, the camp will be made the base for trips all over the great watershed of the Belly River and into the Waterton Lakes region.

This development of the Belly River Valley will be an advance step as momentous as the opening of the St. Mary and Swiftcurrent Valleys, and will bring pleasure to thousands of lovers of Glacier's trails who will go back to use and enjoy the new facilities.

TELEPHONE LINES AND OTHER IMPROVEMENTS.

Because roads and trails are the crying need of Glacier National Park, I have laid special emphasis on these features, but next in importance to them is the pressing requirement of a new telephone system. As a fire protection and as an aid to administration of the

park and the transaction of the business of the hotels and transportation lines, especially the saddle-horse enterprise, a good telephone system is essential. In Glacier Park our system is exceedingly poor. It should be rebuilt, and it is particularly advisable to build a line along the railroad from Belton to Glacier Park in order that communication may be had between the two sides of the park. Telephone lines should also be built to Waterton Lake and Belly River region.

ADMINISTRATION SITE SUGGESTIONS.

Further improvement of the administrative site at Belton is needed. A headquarters building and more quarters for employees are among the important requirements. Likewise the installation of an adequate water system should be undertaken in the early future.

The pending deficiency bill contains an item of $12,000 for a new bridge over the Flathead River at Belton, and this structure will be erected before the beginning of the next season.

IRRIGATION WORKS IN OPERATION.

The dam at the lower end of Sherburne Lakes is completed and the level of the lakes was raised considerably this season, backing up the water into the timber and creating a scene of havoc that was expected by all who have watched the progress of this irrigation project. It is almost too late to cut the trees and brush that will be killed by the raising of these lakes, but I reiterate that this work should have been done either as a part of the execution of the project or as a separate proposition under authority of Congress. The scenic beauty of the approach to the Swiftcurrent Valley and Many Glacier Hotel will be seriously impaired, and it is not unlikely that the road will be undermined and destroyed in places on account of this flooding, all to the detriment of the park. The only satisfaction that one can gain from the situation is that it becomes a glaring example of what is to be avoided in all of the national parks having lakes still untouched, and hence may serve some good purpose in national park protection.

It is possible that Lower Two Medicine Lake may be raised next year, thus injuring the approach to the main Two Medicine Valley and the chalet group. As the fire burned over part of the area that will be flooded, this valley is not likely to suffer as much from the water as the Sherburne Lakes region, but the fire devastation, combined with the action of the water, will make a situation just as unsightly to the park visitor.

WILD ANIMALS FLOURISHING.

In cooperation with the Biological Survey, during the past year, very satisfactory progress was made in destroying predatory animals. As a result, the deer of the park have become more numerous and other animals are in better condition on this account.

I am much interested in establishing a small herd of buffalo on the east side of the park, which is an old range of this animal. However, funds for this project are not available now, and it can not be undertaken.

Fishing is becoming better each year, and it is evident that the hatchery established last year at Glacier Park station is successfully performing a great public service.

DESIRABLE PARK EXTENSION.

For some years difficulty in protecting the wild life of the park and regulating traffic on the sections of the park road in the Indian Reservation have prompted the raising of the question whether or not the park lines ought to be extended eastward to include the road. This would give the elk and deer winter and early spring range within the park boundary, and would make it possible to regulate the speed limit of the private cars and otherwise protect automobile travel, and at the same time the road improvements.

This land, of course, must be purchased from the Blackfeet Indians, but it is necessary to the proper administration of the park, and will have to be acquired some time. It would be better to acquire it now, before it is allotted or opened to general settlement, than in the future, when much more trouble and expense will be involved in securing it. During the past year the constant trespassing of cattle on the roads has been a source of unending annoyance to tourists.

CONNECTING YELLOWSTONE AND GLACIER.

Definitely associating Yellowstone with Glacier National Park in this report is simply following the general trend of events of the summer in the Northwest, and especially in Montana.

Early in the spring Montana entered upon a road improvement campaign that was probably as successful as any similar campaign ever undertaken. Led by Mr. H. W. Child, of the Yellowstone Park Transportation Co., and Mr. G. L. Ramsey, of Helena, a group of citizens toured the State in the yellow cars of the transportation company advocating road development in anticipation of a great influx of motorists during the summer.

So effective was this work that the entire State threw itself into the work of road repair. In some towns all business houses were closed, while their owners worked on the highways. Many road bond issues were passed upon favorably by the voters, and conditions were bettered everywhere.

The prospects of heavy tourist travel that prompted this movement were founded, of course, on the relation of Glacier and Yellowstone Parks to Montana. It was natural, then, that special attention was given to highways connecting or leading to these parks. Such attention was given to these roads in great abundance with the result that the interpark routes via Helena and Choteau and via Missoula and the Flathead Valley were in excellent condition except the portion of the Helena route that crosses the Blackfeet Indian Reservation.

In this connection it should be recorded that the "Geysers to Glaciers Highway" was organized and promoted during the season. It takes its course through Livingston, Bozeman, Three Forks, Helena, and Choteau, and is a very scenic route. The signs of this trail are very striking and effective.

THE YELLOWSTONE-GLACIER BEE-LINE HIGHWAY.

The Yellowstone-Glacier Bee-Line Highway, which goes through Livingston, White Sulphur Springs, Great Falls, and Choteau, traversing the Little Belt Mountains, was not completed for traffic this year, but will be open next season and will be a popular route between the parks, not only because it will be a short route, but because it will be scenic. A convention of the Yellowstone-Glacier Bee-Line Highway Association was held in Livingston on August 15 and 16, 1919.

INTERPARK AUTO SERVICE.

Another exceedingly interesting development of the season was the operation of an automobile passenger service between the parks via the "Geysers to Glaciers" route. Cars of the Yellowstone Park Transportation Co. carried passengers to Helena from Yellowstone Park, where they were transferred to cars of the Glacier Park Transportation Co. and taken northward; likewise service was rendered in the other direction with Helena the transfer point. The line will be operated again next year.

To care for this and the great volume of other tourist travel that it enjoys, Helena is planning the construction of an enormous resort hotel.

INTERPARK TRAIN SERVICE ADVISABLE.

An immense number of tourists also visited Yellowstone and Glacier, using train service between these parks. In fact, so many people made this trip between the parks that I regard this travel as an established business which warrants the use of a through sleeper between Gardiner and Glacier Park, and I believe the Northern Pacific and Great Northern lines should jointly arrange for this service. It would be a great convenience to the traveling public and would serve to bind together even more closely the common interests and destinies of the two great national parks.

YOSEMITE NATIONAL PARK.

Thronged with thousands of happy vacationists from late spring to the end of the summer season, Yosemite National Park in the year 1919 has attained a new record of usefulness in the life of the Nation. Vastly more people toured the park this year than ever before, and it is especially worthy of note that the upper reaches of this great scenic playground were more popular with visitors this year than during any past season.

Travel to the park began earlier than usual, and, what is more remarkable, the volume was sustained at a high level long after the falls of the famous valley had spent their flood waters and subsided to their normal summer flow, thus indicating that the scenery of the park aside from the falls and the unsurpassed opportunities for rest and recreation that it offers to the visitor have at last made their appeal felt, bringing a public response that will soon result in the use of every nook and corner of this beautiful mountain region.

THE NEW YOSEMITE.

This broader understanding and appreciation of the park became general even faster than we had dared to hope, although for years we have been looking forward to the time when the people would come to the realization that the Yosemite possesses vastly more charms than those of the great valley and its waterfalls, spires, and towering cliffs. We had anticipated a slower growth of the new conception, and this expectation was shared by the business interests of the park who, in common with our administration, found all facilities for accommodating the travel hardly adequate to render satisfactory service. However, our future course is now definitely marked for all of us, and likewise the time limits within which necessary improvements must be made have been indicated. Funds must be provided by the Federal Government for extensive development of roads and trails and sanitation systems, while the enterprises engaged in furnishing accommodations of various kinds must enlarge their establishments and better prepare to meet the ever-increasing demand for every type of service.

YOSEMITE VALLEY MORE POPULAR THAN EVER.

Travel in the Yosemite Valley this year was astounding, as many as 6,000 people enjoying its attractions at one time. Fully half of these visitors were accommodated in the great public automobile camps which have become one of the most popular features of the park.

Accommodations in the big permanent camps and in the hotel were particularly strained during the period of the convention of the Native Sons of the Golden West, which was responsible for bringing to the park more than 1,800 visitors in addition to the usual general tourist travel. This convention assembled on June 1 and continued for five days. During this time the schoolhouse and other available public buildings had to be utilized for sleeping quarters.

TUOLUMNE MEADOWS CAMPERS' PARADISE.

In the high Sierra, especially in the Tuolumne Meadows on the Tioga Road, camps were maintained throughout the summer. Here, too, the Sierra Club made its headquarters for its summer outing. I also had an opportunity to experience the pleasures of camping in this charming mountain vale. This is a section of the park that John Muir so often referred to in enthusiastic terms, and in my little outing there I came under the same spell that prompted Muir's enthusiasm.

The motorist may be expected to utilize to the fullest extent its natural resort possibilities. In fact, with the fast spreading interest in the upper portions of the park, we may reasonably expect to find it necessary to soon establish regular automobile camps in the Tuolumne Meadows, in order to avoid insanitation and similar evils that might naturally follow too large an influx of tourists in this section.

Thus the automobile camp in the mountain districts of this park becomes a problem demanding immediate solution just as it does in Yellowstone, Rocky Mountain, and other parks where the private

camping outfit is becoming the most popular means of enjoying a vacation in the great out of doors.

EMERGENCY IMPROVEMENTS NECESSARY THIS YEAR.

No extensive improvements were made by the business enterprises of the park during the past year, although Camp Yosemite was very much bettered by the practical reconstruction of the dining room and by extensive enlargement of kitchen facilities. These improvements were finished by June 1 and helped the Yosemite National Park Co. very materially in caring for its share of the tourist crowds that thronged the valley. These betterments, however, were necessarily temporary, as the plans for the new camp call for a new location. In fact, the new building program means a radical change in the layout of the entire camp.

Some improvements were made in the Sentinel Hotel, the only hotel on the floor of the valley, and a large number of visitors were accommodated there. If the plans of the Yosemite National Park Co. are carried out during the coming year this old landmark, which has far outgrown its usefulness, will be replaced by a new hotel in the valley to accommodate at least 600 people. The new structure will be located on a site selected three years ago, when the future administrative village was planned.

BIG DEVELOPMENT COMING.

The directors of the Yosemite National Park Co., which, it should be noted, is composed of a group of far-seeing business men of San Francisco and Los Angeles, headed by Mr. A. B. C. Dohrmann, realize that the travel to Yosemite has increased to a point where improvements must be made on a scale which it was expected would not be needed for at least five years. Their preliminary plans, formulated only a short time ago, contemplated improvements to the extent of about $300,000, but Mr. Dohrmann now estimates that to care for the travel which is certain to come to Yosemite National Park next year improvements should be made at an aggregate cost of at least $1,500,000. This contemplates the construction of the new hotel on the floor of the Yosemite Valley; the building of the new Camp Yosemite; further developments in the sanitation system and water supply of the Glacier Point Hotel; and the building of a camp in the Tuolumne Meadows, where the tourist is already clamoring for accommodations and where at present there are no facilities except for the private camper who brings his own equipment and supplies. The establishment of such a camp at Tuolumne Meadows in connection with the camps already maintained at Merced Lake and Tenaya Lake will greatly increase the accommodations for the tourist in the back country.

The establishment of a lunch camp by the same company in the Mariposa Grove of Big Trees has been a considerable help to tourists and will be still more valuable next year. Many of the motorists reaching the park by way of the big grove feel the need for hotel accommodations at that point before passing on to the heart of the park.

GLACIER POINT ENJOYED BY THOUSANDS.

The Glacier Point Hotel, which was constructed some three years ago, has been more largely patronized this year than ever before, having been filled to capacity during much of the season. This hotel is necessarily closed in the middle of the winter on account of its inaccessibility, but plans are being considered by us for the possible construction of a shaft from the level of the valley floor to Glacier Point, which would make this spot far more accessible in winter than it is at the present time even in summer. It would have the added advantage of opening up the splendid slopes of the Sentinel Dome behind the hotel for winter sports and could be made one of the most unique winter resorts of the world.

CAMP CURRY PLANS ENLARGEMENT.

At Camp Curry, which is operated under the management of Mrs. D. A. Curry and her son, Foster Curry, improvements begun last year were brought to completion. The new bungalow unit of the camp has been especially popular. Before the opening of next season a number of the central buildings of the establishment will be rebuilt or enlarged, and other steps will be taken to extend the facilities of the camp to meet the demands of its ever-increasing patronage.

NEW TRANSPORTATION ROUTES.

A very interesting service performed by the Yosemite National Park Co. during the past summer was the providing of a combined automobile and rail trip to the Hetch Hetchy Valley. Although this was a new venture it was patronized to a considerable extent and gave many visitors the opportunity of seeing the famous Hetch Hetchy Valley and the extensive work which the city of San Francisco is doing at that point in connection with the development of its water supply.

While visiting the park during the summer Mr. Harry Chandler, editor of the Los Angeles Times, conceived a plan to establish a most unique trip from Southern California to the Yosemite and Lake Tahoe. His idea was that two parties of about equal size should be started simultaneously from Los Angeles several times a week, one for Yosemite National Park and the other for Lake Tahoe; and from these points they should proceed in opposite directions by way of the Tioga Road to Lake Tahoe and Yosemite, respectively, using the same motor equipment and thus affording an opportunity for both groups to see both scenic areas by rail and automobile. The trip, of course, could have been made from many California points, but the plan was to initiate the tours in Los Angeles this year. Mr. Chandler, however, was unable to make arrangements with the railroad authorities for proper excursion rates. If this plan can be perfected next season it will make available in California a most interesting and thrilling combined automobile and railroad trip; one that in a few years will have a nation-wide reputation for varied scenery and recreation possibilities.

MUCH TRAVEL BETWEEN YOSEMITE AND LAKE TAHOE.

Meanwhile private motorists in great numbers have obtained a full measure of enjoyment by driving their cars over the Tioga Road and between Yosemite National Park and Lake Tahoe. In California this trip is already regarded as second to no other mountain tour. Mr. Chandler's plan would extend to people who are touring the country by train the opportunity to make this extraordinary trip through providing a method of sustaining a regular automobile line with reasonable rates for transportation service between Yosemite Valley and Lake Tahoe.

EL CAMINO SIERRA AND THE TIOGA ROAD.

Another extremely interesting feature of this season's travel to Yosemite is the general use of the road running north and south along the east base of the Sierra Nevada Range—El Camino Sierra. The road connecting Lake Tahoe and the Tioga Road is part of this route, and, of course, there was unusual travel over this section. But scores of cars came from the East and from Southern California over the lower portion of the highway, traversing Owens Valley and running the entire gamut of the Sierra as they rise sheer 8,000 to 11,000 feet above the automobile road.

This and the Tahoe travel naturally made Tioga Pass one of the most important gateways to the park, and the Tioga Road became more popular as a motor thoroughfare than ever before. As automobile tours from the Eastern States increase, this gateway will grow more and more useful, and the time is not far distant when it will admit an enormous number of visitors to the park.

Mr. George Horace Lorimer, editor of Saturday Evening Post, on visiting the Yosemite this past summer for the first time remarked, after his trip over the Tioga Road and up the El Camino Sierra to Lake Tahoe, that he considered it the most beautiful and varied run in America.

ALL-YEAR-ROUND ROAD PROJECTED.

Last winter while in the West investigating conditions in several parks with a view to developing winter sports, I induced a group of San Francisco business men, including several members of the Sierra Club, to accompany me to Yosemite Valley. The trip was made between Christmas and New Year's. A recent fall of snow had made the valley a winter fairyland more beautiful than any words can describe. Every member of the party was entranced by the spectacle, and while each enjoyed every moment of the days spent amid these sublime surroundings there was no one who failed to attempt the conception of a plan to make the valley more accessible in the winter season. At length it was suggested by Mr. Rudolph Spreckels that a drive be conducted in the State to raise a million dollars which, with certain State and Federal funds that were available, would build a road from Mariposa to El Portal on a low grade and below the line of heavy snows, and pave the highway the entire distance between Merced and the park boundary, thus joining the State highway system with the splendid new road that the Govern-

ment is building from El Portal to Yosemite Valley. Such a road would make possible a trip by automobile from most California points to the valley at any time of the year and under almost any weather conditions.

Plans for this campaign were immediately developed, and the Yosemite Valley Highway Association with State-wide membership was organized, but investigation disclosed the fact that war-service drives and other public requests for voluntary contributions of money had so taxed the people that the prospects of success of a road-improvement campaign of this kind were not at all bright. Accordingly, authority was granted, with your approval, for the sale of certificates which would be exchangeable at the park gates for automobile season permits, these certificates to be sold at the uniform price of $5. The campaign is now in progress with every prospect of success. Meanwhile the State highway commission has let contracts for the construction of certain portions of the project, and it is hoped that the new road will be completed for summer travel in 1921, and for winter use late the same year or in the early months of 1922.

PAVED ROAD PROGRAM FOR YOSEMITE.

The completion of this paved road to the gates of the park will, of course, make it necessary for the Government to pave the new El Portal Highway and the road system of the valley floor. This paving ought to be done while the State's approach road is building, because the volume of travel that will enter the park the first season after the new highway is open will completely ruin our present graveled roads. Accordingly, I am submitting to you this month an estimate calling for an appropriation of $75,000 to begin the paving of the El Portal Road toward the valley.

This fine highway, 20 feet in width, with a protective parapet of granite along the river, has already met with much praise from the tourists who have traveled over it, but its true value will not be appreciated until the State highway that will tie up with it has been completed from Merced to the park boundary. It must be remembered that at the present time it is impossible for the motorists to reach the valley by existing automobile roads until May because of snow conditions on the high level, but the new road will obviate all this, and there will be no difficulty on the part of the Park Service in keeping the roads in the valley open in ordinary winters, as the fall is light on the valley floor.

THE YOSEMITE VALLEY-NEVADA FALLS-TENAYA ROAD.

In my outline of the year's activities of the engineering division, I mentioned the survey of a highway to connect Yosemite Valley with Tenaya Lake by way of Nevada Falls, Little Yosemite, Forsyth Pass, and the upper portion of Tenaya Canyon. This road is an essential project of the immediate future, and must be built to give quick access to the high Sierra section of the park and afford a means of relieving traffic congestion on the floor of Yosemite Valley. It will cost approximately a half million dollars, and it will take several years to complete the project. The route has been made especially complex and costly due to our successful effort to run a

Photograph by Wiswall Brothers.

A. LAKE NANITA.

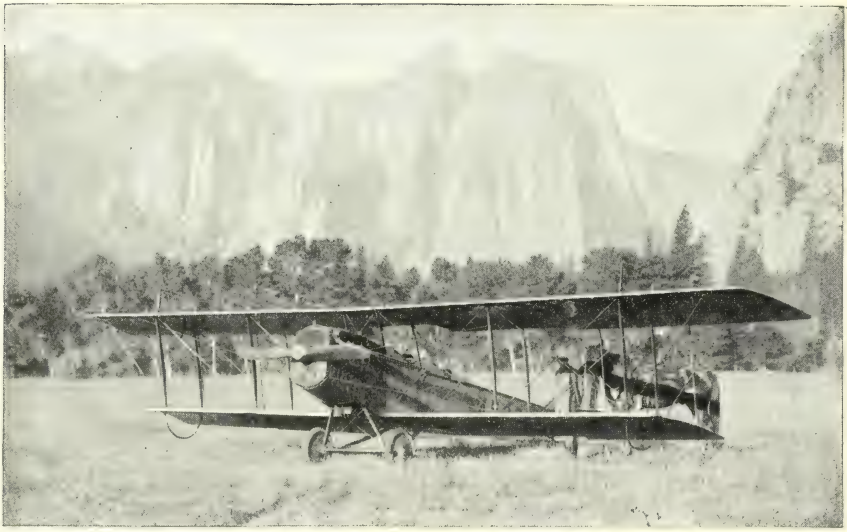
This region on the west side of the park opened up by new trail connecting with the Flattop Trail.

Photograph by G. H. Harvey, Jr.

B. ON THE CONTINENTAL DIVIDE.

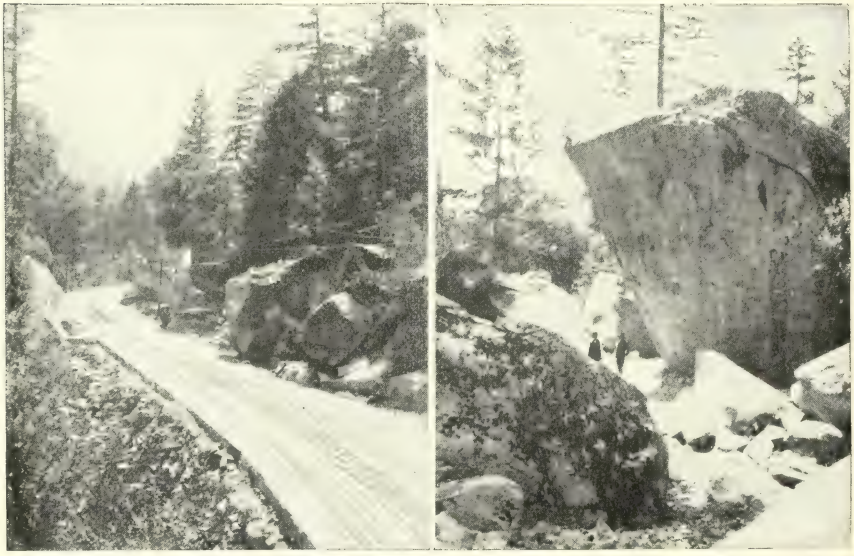
Longs Peak in the distance.

ROCKY MOUNTAIN NATIONAL PARK.



A. FIRST AEROPLANE TO LAND IN YOSEMITE VALLEY.

Piloted from Merced, Calif., on May 25, 1919, by Lieut. J. S. Krull, U. S. Army.

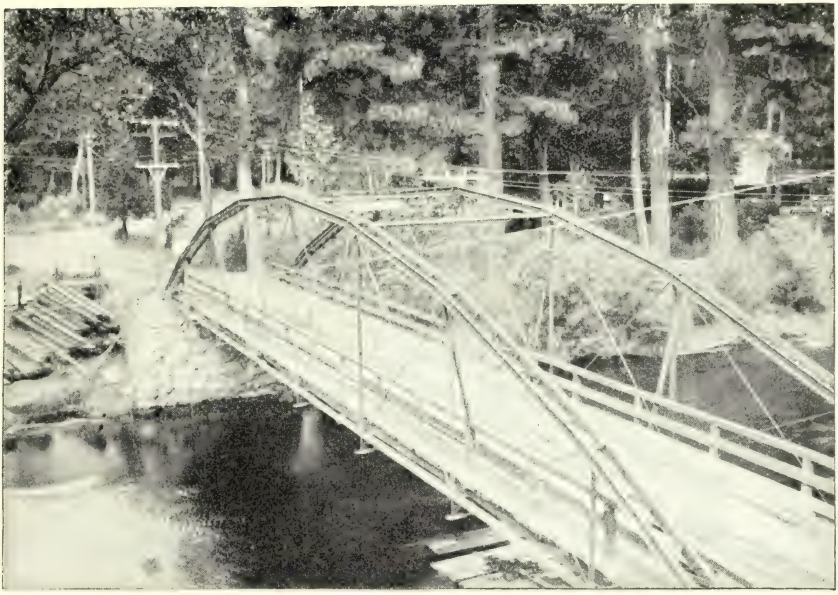


Photographs by National Park Service.

Finished grade. During construction.

B. EL PORTAL ROAD.

YOSEMITE NATIONAL PARK.



A. OLD SENTINEL BRIDGE.

B. NEW SENTINEL BRIDGE.

Erected in 1918–1919.

YOSEMITE NATIONAL PARK.

Photographs by National Park Service.

Photograph by H. C. Tibbetts.

IN MUIR WOODS.

NATIONAL MONUMENT, CALIFORNIA.

A WORN GRANITE MOUNTAIN SURFACE.

LAFAYETTE NATIONAL PARK, MAINE.

line that can not by any stretch of the imagination injure the scenic beauty of Happy Isles and Vernal and Nevada Falls.

WINTER SPORTS IN YOSEMITE.

I was most favorably impressed with the availability of Yosemite Valley and its adjacent regions for almost every kind of winter sport—skating, skiing, snowshoeing, sleighing, and related diversions. Unquestionably the park can be made the scene of remarkably successful winter carnivals immediately when the new all-year road is completed, and I believe we should leave no effort unexpended that would bring this fascinating prospect into complete fulfillment. The new hotel will undoubtedly be completed by the time the first large carnival can be held, and should these winter sports in Yosemite Valley prove as popular as we expect them to be, no difficulty will be experienced in financing the construction of some adequate means of reaching Glacier Point. I have already mentioned the possibility of building a shaft in the granite wall below Glacier Point.

The managers of the great winter-resort hotels in southern California and along the coast are watching the Yosemite hotel developments with much interest, realizing that the opportunity to send their patrons there conveniently and comfortably for short trips during the winter would add considerably to their enjoyment of the State.

THE SIERRA CLUB OUTING.

The Sierra Club had a very interesting outing in the park during the summer. It was attended by over 150 of its members. The main camp was in the Tuolumne Meadows, from which trips were made to different parts of the park, the most extensive trips being to Mount Lyell and Mount Ritter and the Devil Postpile, lying to the south of the park in a section which formely was a part of the reservation. It is a remarkably scenic area which in my belief should be added to the park again in the near future.

HALF DOME SCALABLE NOW.

A very useful contribution to the park was made this year by the donation, through the Sierra Club, of a protection for the trail to the top of Half Dome. A double row of iron posts about waist high were set in holes drilled in the rock. Through "eyes" in the top of these posts, formed by turning the metal back in the form of a loop, a steel cable was stretched and securely anchored at the ends. The cable formed a hand rail on either side of the trail, by which a person could pull himself up the steep rock slope. This double cable took the place of a single rope which was attached to small bolts in the rock face and afforded only one aid by which the climber pulled himself up hand over hand. The old arrangement was dangerous and unsafe. It was placed by an old sailor in the late eighties. The new cable was installed early in July, and it was used by climbers who appreciated keenly the opportunity of seeing the wonderful view from the top of Half Dome, with its sheer drop of practically 5,000 feet to the valley below.

TRAIL DEVELOPMENT IN CONTEMPLATION.

The Sierra Club has continued to take its usual great interest in the park. I have had a number of conferences with the officers of this organization, and they have offered valuable suggestions in regard to the trail development which we expect to make through the outlying sections of the park as soon as the more pressing problems in the Yosemite Valley have been solved.

Anticipating a much greater use of the trails each season, we began this year the development of the Grand Canyon of the Tuolumne River for the hiker and horseback rider. A trail is now being built from Harden Lake to Pate Valley on the floor of the Tuolumne Canyon.

Next year, if funds are available, this trail will be continued up Piute Creek to join the Pleasant Valley Trail on the north side of the canyon. Also it is proposed to continue the trail which now reaches the Upper Water Wheel Falls in the canyon to Pate Valley, thus making the gorge accessible from the north and south rims and from the very popular Tuolumne Meadows region.

In planning this comprehensive trail improvement the advice and assistance of the Sierra Club has been invaluable.

FISH HATCHERY DELAYED.

Fishing has been better than usual during the past season, and the planting of young fish through the park has received an additional impetus this year through the establishment of a temporary hatchery by the State Fish and Game Commission at Happy Isles. While the structure is only a temporary one, the installation of troughs and other apparatus is excellent, and with the relatively low temperature of the water furnished by the National Park Service from the old intake to the power plant the young fry have thrived splendidly. The temperature at no time during the summer was higher than 66 degrees, which I was informed by the office of the Fish Commission made conditions for hatching better than in any other hatchery in that portion of the State.

Unfortunately the building to house this hatchery has not been constructed. A very attractive building has been planned by the State architect and approved by me, but its construction, involving an expenditure of about $17,000, was held up by the State board of control. As an advance agreement had been entered into between the State and the National Park Service in regard to this work, I consider the State's share of the contract should be carried out. I am sure that the misunderstanding will be cleared up, and I have personally brought the matter to the attention of the governor of California. I believe that another year will see this building finished. The fishing in the park is so largely enjoyed by the people of California, while the distribution of the fish to the different lakes and rivers is done by our own rangers, that it seems only proper that this contract as made should be executed by both parties, for what it will mean to the residents of the State, outside of the State's own obligation in the matter. Our landscape engineer has plans for beautification of the grounds of the building when completed, among which is the proposed construction of pools in which will be exhibited the various kinds of trout with which the rivers are being

stocked. This will strikingly convey to the eastern tourist, as well as to Californians, the excellence of the work of the State Fish and Game Commission.

ESSENTIAL GAME PRESERVES.

I am continuing to urge on this commission the importance of game preserves adjoining the west boundary in order that the deer may be better protected during the winter season when they are compelled to range outside the park for feed. The deer are very plentiful in the park this year and have been very tame. I personally counted 75 deer in the latter part of May of this year on the road between Wawona and Inspiration Point. General comment has been made that the regulation keeping dogs out of the park has led to greater fearlessness on the part of deer, and it is a common thing to find them grazing within 50 feet of the road. The destruction of predatory animals, particularly of mountain lion, in the last year or two, has helped to increase the number of deer.

CALIFORNIA CEDES JURISDICTION.

The regulations governing the protection of the fish and wild animals of the park, as well as other rules of equal importance, will be strengthened and made more effective as soon as the Federal Government accepts the exclusive jurisdiction over the park which was tendered by an act of the Legislature of California approved April 15, 1919.[1]

Lack of a Federal tribunal in the park, with power to punish violations of the rules and regulations, has very seriously handicapped the administration of the reservation, and as travel increases the difficulties of protecting the park and the lives and property of its visitors will increase beyond the limits of any control unless almost immediate action is taken to meet the situation. Bills[2] are pending in Congress providing for the acceptance of this tender of exclusive jurisdiction and the appointment of a court commissioner to try cases of violations of the regulations or misdemeanors committed in violation of the Federal or State laws.

The State cession of exclusive jurisdiction and the pending Federal legislation accepting this act also cover control of Sequoia and General Grant National Parks.

SOME PUBLIC UTILITIES INADEQUATE.

The public automobile camps of the Yosemite Valley have been used to a remarkable degree and a more complete system will have to be worked out in allotting space and providing accommodations. It is my hope that the camps in the valley at least can be all lighted by electricity.

The electric-light plant continues to give excellent service, and will be able to take care of the requirements of the park for many years to come.

The telephone lines are now in excellent shape and 24-hour service is furnished. The importance of having good telephone and telegraph

[1] See text of act in Appendix D.
[2] See reference to H. R. 7971 and H. R. 8039, on p. 1646.

connections in the park can not be overstated. There is an insistent demand on the part of the public for these facilities, and I hope before another year, by conference with the officials of the telegraph companies, to still further improve the wire service. At present the office at Merced, through which all the business has to be handled, is closed at 9 o'clock, although there is a mass of business tendered to us in the way of night letters, etc., which can not be put on the wire. With the many thousands of people in the park at one time, the necessity of a perfect service of this kind becomes apparent.

The post-office facilities are in great need of improvement, and I hope to take this question up this winter with the proper officials and develop some plan for the improvement of the general mail facilities in all the parks. The Post Office Department has been studying the situation, particularly in the Yosemite, where the mail congestion is very great, and where it has frequently been necessary to wait several days before being able to secure a money order. I am sure the Post Office Department desires to have the same efficient service in the post offices in the national parks as in other regularly established offices, and while the business is largely a seasonal one there should be no difficulty in working out proper arrangements, as the revenues accruing to the department during the season are very large. It is my hope to see the best of service in the park, not only by our organization but also by the other Federal departments that are cooperating with us.

THE LE CONTE MEMORIAL LECTURES.

In the general discussion of progress made in advancing the educational use of the park, I mentioned the Le Conte Memorial lectures delivered this year in the Yosemite Valley under the direction of the extension division of the University of California. These lectures were one of the most important features of this exceedingly successful park season, and their establishment as a park institution to continue indefinitely is a source of keenest delight and satisfaction to me.

Our thanks are due the University of California for initiating this course, and for other courtesies extended, not the least of which is the undertaking of a comprehensive study of the animal life of the park under the direction of Dr. J. Grinnell, of the department of zoology. The results of Dr. Grinnell's work will probably appear next year, and will be a distinctly valuable addition to the literature of the parks.

STATE AND FEDERAL COOPERATION.

In the repair of approach roads to the park, and in planning the new El Portal lateral, the State highway commission has rendered effective aid to the National Park Service this year. The State fish and game commission has done all in its power to better the sport of fishing in the park, and is prepared to build the new hatchery as soon as requisite authority is obtained.

Exceedingly important cooperative work was performed by the United States Public Health Service in combating the mosquito evil in Yosemite Valley, and in making a comprehensive survey of the

sanitation needs of the park. The result of this survey indicates that the entire sanitation system of the valley must be rebuilt immediately.

To make a detailed survey of the Yosemite Valley, the Geological Survey has detailed a topographic engineer, and the Bureau of Entomology has continued to give extensive assistance in controlling insect pests that are attacking the forests in certain parts of the park.

SEQUOIA NATIONAL PARK.

Sequoia National Park has been much in the public eye this year on account of the consideration of legislation in Congress which proposes to enlarge its boundaries to include the Kern and Kings River gorges, the Great Western Divide, and some 60 miles of the crest of the Sierra Nevada Mountains, including Mount Whitney—an area of approximately 1,300 square miles—and to change the name of the park to Roosevelt National Park.

As far as boundary lines and area are concerned, this is the "Greater Sequoia" project which we have long advocated, but in its new conception as a great national memorial to the late ex-President it possesses an appropriateness and country-wide significance of which even John Muir and his associates of the mountains who planned this big park could not have dreamed.

THE ROOSEVELT NATIONAL PARK SUGGESTED.

It was at a gathering of members of the Boone and Crockett Club in New York, on January 10, 1919, that the idea of setting apart this wondrous region of mighty mountains, tremendous gorges, giant monoliths of granite, thundering waterfalls, the biggest and oldest trees of the world, and other works of nature on her grandest scale as a memorial park to Theodore Roosevelt was suggested by Capt. Frank Lyman. The ex-President had passed away only four days before, and his loss was an overwhelming blow to the Boone and Crockett Club, which he had founded in 1888, after his first years in the great West, and which is an association of men interested in out-of-doors, hunting, and game conservation. It was natural that his fellow club members should have been discussing at their gathering an appropriate memorial to their beloved leader and friend. It was natural that they should have sought to find something in the West that typified the virile body and spirit of Roosevelt in his lifetime.

The Sierra region of the Sequoia Park extension plan presented every element of this idea, and believing that no finer memorial than this vast region as the Roosevelt National Park could be dedicated to the great man's memory, Capt. Lyman's suggestion was heartily approved and arrangements were made to present the park plan to Congress.

LEGISLATION IN CONGRESS.

In Congress the plan met with the unanimous approval of the Senate, but in the House of Representatives opposition developed, not to the idea of a national park dedicated in honor of Col. Roosevelt, but

to the extent of territory affected by the pending bill and to the use of this region, and the measure was not brought to a vote before the close of the session. This legislation was Senate bill 2021, introduced by Senator Phelan, of California, providing for the extension of Sequoia National Park when first introduced on April 21, 1917, but containing an amendment changing the name of the enlarged park to the Roosevelt National Park when it was reported from the Senate Committee on Public Lands on January 16, 1919.[1] This bill was passed by the Senate on the day it was reported from the committee, but, as I have stated, was not considered by the House.

In the Public Lands Committee of the House, after a discussion of the arguments of the opponents of the legislation in the light of a report by the Department of Agriculture that it could not approve the measure because of lack of certain information, the bill was changed by striking out all provision for the extension of Sequoia Park. It thus appeared in the House as a proposal simply to change the name of the existing Sequoia National Park.

NEW BILLS INTRODUCED.

Early in the current session of the Sixty-sixth Congress bills identical with the measure that passed the Senate in January were introduced by Senator Phelan and Mr. Elston, of California. These bills are S. 1391 and H. R. 5006, and are awaiting committee action at the present time.

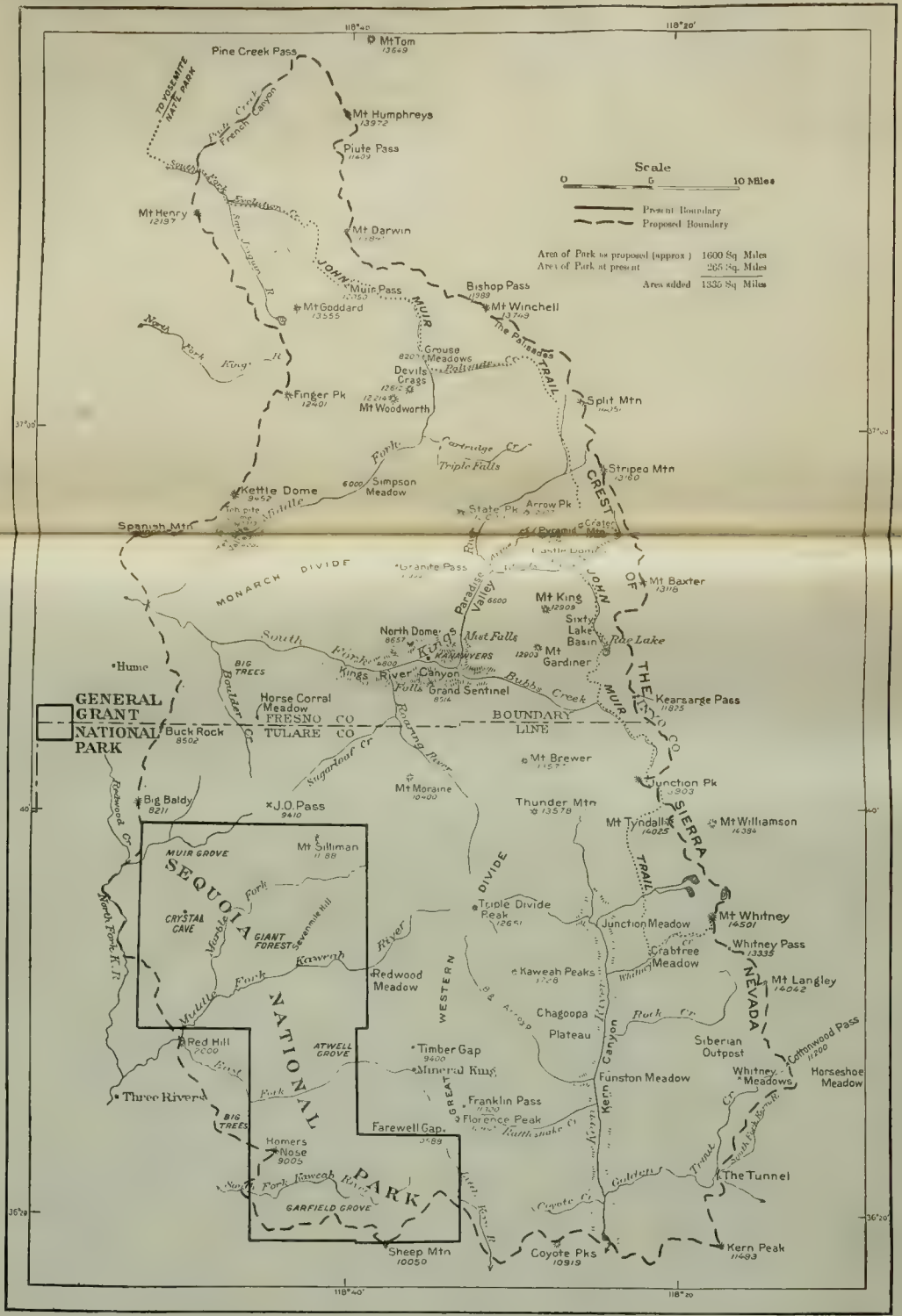
During the past few months much investigation and study have been given to this project by the Sierra Club and by many eastern people who have visited this area for the particular purpose of studying its value as a great recreative park and also as a memorial to Col. Roosevelt. An effort to come to a basis of understanding with the Forest Service, in whose jurisdiction the area now lies, has been rather futile, the two bureaus being so far apart in their point of view as to the territory to be included. Nevertheless sentiment in California and in the Nation at large is so generally favorable to this project that there are good grounds for feeling that it will soon be approved by Congress.

DEVELOPMENT RETARDED.

The future of Sequoia National Park depends so much on the outcome of the enlargement project that we have rather delayed planning any extensive improvements for the area, and have contented ourselves, especially during the past year, with maintaining the existing roads, trails, and other utilities of the park in proper condition for public use.

Nothing of importance has been accomplished in a constructive way within the park either by the Service or by the concessioners. No serious attempt has been made to extend the facilities of the various business interests because of the relation of the extension project to their properties. When the larger development of the existing park is made in connection with the territory to be added to it, the scale of operations of these interests must be so tremendously

[1] See committee report in Appendix D, p. 1224. Also excerpts from Congressional Record on p. 1232.



MAP SHOWING PROPOSED ENLARGEMENT OF THE SEQUOIA NATIONAL PARK TO BE KNOWN AS THE ROOSEVELT NATIONAL PARK.

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expanded that a general readjustment of all concessions may be necessary in order to provide adequate service for the touring public.

CRYSTAL CAVE CLOSED.

It has not even seemed advisable to take any steps this year to open the recently discovered Crystal Cave to public inspection. This beautiful cavern was opened for a period last season, but on account of vandalism access to it was barred by closing and blocking its entrance. It could only be maintained in its present condition by the installation and operation of a proper lighting system and by the employment of guides to conduct parties through its various passages and prevent depredations on its formations.

YOSEMITE POWER PLANT FOR SEQUOIA PARK.

For possible use in lighting the Crystal Cave, but particularly for the purpose of lighting the public camps of the Giant Forest, it is proposed to move next year to Sequoia National Park the power plant in Yosemite Valley, which was superseded by the large new plant recently completed to meet the increased demand for electric power in the northern park. The installation of this plant in Sequoia Park will be one of the most effective improvements that could be made in that reservation at this stage of its development.

PUBLIC CAMP SITUATION.

The public camps in Sequoia Park present a very serious problem and need considerable attention as to control, sanitation, and water supply. There has been little done toward the control of the camp sites, with the result that campers have not only overrun the whole Giant Forest but concentrated around the village to such a degree that they have completely destroyed the shrubs and other ground cover. During the past season camps have been located in the Deer Creek Valley and in every other direction that expansion could be made.

The most interesting and the largest of the trees are in the vicinity of the hotel camp and around the meadows, and I am of the opinion that ultimately this area should be reserved for its scenery alone, the hotel being relocated in another part of the forest. New camp sites should be located off the road and between the Wolverton Road and the trail to the Gen. Sherman Tree.

A condition has arisen in Sequoia Park which makes it necessary to bring up clearly and unequivocally our policy as regards locations of public camps. A tendency has been shown toward building semipermanent camps in or near the Giant Forest. Our policy is very distinctly that within national park areas no individual shall have any permanent location for his own use, and it has been necessary to bring this clearly to the attention of some of the people camping in the Giant Forest. Experience in Yosemite and General Grant National Parks has shown that it is perfectly feasible for many thousands of people to camp for a season in a location which becomes theirs for the time being, but on which they have no further claim the following year, those coming in first during the season having the first call on locations.

OLD ROADS AND NEW ROADS.

The road system of the park was maintained in good condition throughout the season, the main highway to and through the Giant Forest being repaired and its upkeep provided for by the National Park Service; the road up the Middle Fork of the Kaweah being cared for by the Mount Whitney Power Co., and the Mineral King Road receiving some repairs as a county charge.

Whether the park is enlarged or not, two new road approaches ought to be undertaken, one not later than next season. These projects contemplate the construction of a road from a point on the Middle Fork of Kaweah River near Hospital Rock to the Giant Forest road system, and the continuation of the road between Sequoia and General Grant National Parks, which was begun two years ago and carried as far as the Marble Fork of the Kaweah. The former project is the more important. It will take approximately two years to construct this essential highway, and an estimate to begin the work is included in the National Park Service budget that has just been prepared. The road will be 10 miles in length and it will be a marvelously scenic route. It will afford an opportunity for tourists to enter the park by the Middle Fork Valley, ascend to the Giant Forest, and leave the park by way of the present main highway. In the bond issue of $40,000,000 recently authorized by the people of California, there is included authority for the expenditure of $300,000 in paving the State road from Three Rivers to the park line. If Congress authorizes the construction of the new highway I have just described, the State will carry its paving to the Middle Fork entrance. In planning this development the members of the State highway commission and Tulare County authorities have been working in harmony with the National Park Service.

NEW TRANSPORTATION ENTERPRISE.

The privilege of conducting a transportation service to Sequoia National Park was granted this year to the Sequoia National Park Stage Co., which is owned by Messrs. Orval Overall and E. L. Askin, of Lemon Cove and Visalia, respectively. The plans of these gentlemen originally contemplated service from Visalia as well as from Lemon Cove to the Giant Forest, but the railroad commission declined to sanction the competitive service between Lemon Cove and Visalia. Therefore service is now furnished between these points by the Visalia Electric Railroad, and in consequence the park permittees made Lemon Cove their valley terminus. This transportation question should be reconsidered before the opening of next season. As facilities for caring for the traveler are so much better and the opportunity to supplement the transportation service with outside cars is greater in a city of the size of Visalia than in Lemon Cove, it seems to me that passengers should be carried direct from Visalia to the park rather than be compelled to make a change at an intermediate point. There have been a number of instances this year in which parties arriving at Lemon Cove and finding the regular automobile stages gone, were able to obtain cars only with great difficulty, and some of the eastern travelers who had come across the continent particularly to see the wonderful Giant Forest were compelled to leave without visiting it.

DEER GIVE PLEASURE TO VISITORS.

As usual, the deer have been of great interest to visitors to the park, their tameness being especially marked. This is believed to be due largely to the fact that the deer have the opportunity to wander in the foothill country within the park area without being compelled to go outside the park boundaries, thus having protection at all times of the year. One of the great problems in other parks like Yosemite and Yellowstone Parks is due to the fact that the wild game are compelled to go outside the boundaries to secure their winter feed when severe weather conditions are encountered.

The Fish and Game Commission of California has established a new fish hatchery on one of the branches of the Kaweah River not far from the park boundary. It is the purpose of the commission to keep the waters of the park well stocked with trout after this hatchery is in full operation, the National Park Service cooperating in the transportation and distribution of the fish.

GIANT FOREST PURCHASE AN OBJECT LESSON.

The destruction of trees all along the Pacific coast and particularly along the highways of the northern part of the State, which traverse forests of big redwoods of the species *Sequoia sempervirens*, emphasizes more than ever before the value of the purchase of the Giant Forest by the combined action of Congress and the National Geographic Society. After all, nothing that has been accomplished since the broader development of the national parks began surpasses the achievement of safeguarding forever this noble forest. It narrowly escaped the awful fate of its related forests of the north.

GENERAL GRANT NATIONAL PARK.

As the tables in Supt. Fry's report in Appendix B indicate, travel to General Grant National Park this year has been heavier than ever before. The popularity of this beautiful little park is justly deserved. Not only does it furnish a wonderful summer resort for the people of the San Joaquin Valley, but it preserves a grove of giant sequoia trees that makes it a property of the Nation that ought to be the pride of all generations of the present and future.

The complete cutting off of all the great sequoia timber immediately to the west of the General Grant Park emphasizes very strongly to the visitor the great advantage of having preserved even this small area for park purposes, and with the excellent road now leading up to it, built by the Fresno County authorities, via Dunlap, it is more accessible than ever.

A GATEWAY TO ROOSEVELT PARK.

It now appears that General Grant Park will be one of the main gateways, if not the principal entrance, to the Roosevelt National Park when this great reservation is established. Some years ago the State of California began the construction of a road toward the Kings River Canyon, and this highway will be continued under funds made available by the sale of bonds of the $40,000,000 issue recently approved by the people of the State. One hundred

thousand dollars will be set apart for this purpose. To reach this new State road all travel will have to move through General Grant Park from south to north. If, on the other hand, the main road to Roosevelt Park should be constructed along a route running several miles to the southward, General Grant Park would, without doubt, become the point of departure for the alternative road, although this highway would leave the park at a point on its east boundary instead of from the main north and south highway.

POSSIBLE ADDITION OF SEQUOIA LAKE.

In connection with the establishment and development of the Roosevelt National Park, it has been suggested that certain private lands of the Sanger Lumber Co. lying west of Boulder Creek and on which there are several large stands of giant sequoia trees should be preserved for the benefit of the park and for the purpose of safeguarding these big trees. The proposal made by the lumber company for the transfer of these holdings to the Government included the gift to the Government of Sequoia Lake, which adjoins General Grant National Park. This body of water would make a splendid addition to the park and would greatly enlarge our opportunities for the development of the camp grounds and other recreative features. Even if the plan is not carried out for securing the entire holdings of the lumber company in the proposed Roosevelt Park region, I hope that some proposition can be framed by which this lake can be secured and added to General Grant Park. My visit to this lake, which I saw for the first time this year, impressed on me strongly its value as an adjunct to the park.

SUMMER COLONY PLANNED.

Before the establishment of the park 160 acres within its boundaries passed from the Federal Government to private hands under the land laws of the United States. This tract was purchased some two years ago by Mr. Andy Ferguson, who proposes to develop it as a summer home settlement. He has cut up part of this tract into town lots, which he is offering to the public at reasonable prices. An inspection of Mr. Ferguson's holdings indicates that he is making his improvements in a manner that will preserve the original beauty of the section controlled by him as nearly as this may be possible. He is not allowing any important trees to be cut down and is making other reservations in his deeds for the protection of the park. A settlement of this kind within a national park, especially in a small reservation like General Grant Park, is to be deprecated; but at the same time we must always recognize fully the rights of property owners who acquired their holdings before the park was created. In the case of Mr. Ferguson's holdings it is to be hoped that some equitable arrangement may be made by which the Government can take over this property and develop it in accordance with the policy of the service, at the same time reimbursing the owner for the value of the property and the improvements that he has placed upon it.

IMPROVEMENTS OF THE SEASON.

The principal improvements in the park have been accomplished by the General Grant Park Hotel Co., which maintains and operates

a store and camp. Marked improvements were made in the arrangement of the camp, the dining room being made especially attractive.

We have improved the appearance of the park materially by the removal of some of the old fences and by the construction of a new building to house the park headquarters and post office.

Plans for the building of a gateway into the park are now in readiness, and this work may be carried out during the present fiscal year if the funds will allow. It is likely, however, that this improvement will have to be postponed until next year.

The treatment of the beautiful meadow and also the removal of unsightly spots around the General Grant Tree and the other big trees will also be undertaken next year.

MOUNT RAINIER NATIONAL PARK.

There are many interesting facts to report regarding the 1919 tourist season of Mount Rainier National Park. In the first place, travel to the park exceeded that of any previous year by a very large margin, and, what is more important, there was an enormous increase in eastern travel. This resulted in the hotel and camp establishments being filled to capacity practically every day of the week, a pleasing contrast with former seasons, when midweek travel was relatively light and each Saturday and Sunday brought congestion of all available facilities.

Nevertheless the week-end congestion also occurred this year and presented problems very difficult of solution. Likewise the unusual midweek crowds caused some embarrassment, due to the fact that it was entirely unexpected. Arrangements had been made in advance of the season for several conventions to meet in Paradise Valley during the middle of certain weeks of July and August. These arrangements could not be changed, and the conventions were held as planned, but on each occasion there was a state of overcrowding at the establishments in Paradise Valley that was very annoying, and in isolated cases individuals suffered discomfort and keen disappointment.

MORE ACCOMMODATIONS NEXT YEAR.

These difficulties could have been largely avoided by a better patronage of the National Park Inn and its annex at Longmire Springs, but tourists preferred Paradise Valley and insisted in most cases on making that point their headquarters while in the park.

However, an extension of all housing facilities in Paradise Valley is about to be undertaken, which it is hoped will meet all demands for service at that point for several years to come. These improvements include the construction of permanent buildings of the chalet type for use as sleeping quarters, thus doing away with tents, which are hardly satisfactory on account of the weather conditions at the high altitude of Paradise Valley. These new buildings will be equipped with ample bath and toilet facilities. New kitchens will also be built before next season, and a refrigerating plant will be installed.

SUPERIOR GUIDE SERVICE AVAILABLE.

While there were occasional troubles due to lack of facilities for comfortably housing visitors in Paradise Valley, other service main-

tained for the benefit of the public was never more efficient. The guide service is particularly worthy of complimentary reference. The very intelligent group of men comprising the guide force were exceedingly enthusiastic about their work. They came largely from the faculties of high schools and universities and from college-student bodies.

Every provision was made for the comfort of tramping or riding parties, even to the furnishing of appropriate clothing. Trips to the glaciers and other scenic points of the neighborhood were always appreciated, and the ascent of the mountain was more popular than ever before. During the season more than 300 individuals made this ascent, although among this number were large groups of members of mountaineering clubs camping in the park.

Every precaution was taken to protect the lives and health of the tourists, with excellent results.

LABOR DAY CROWDS.

On Labor Day the largest crowds in the history of the park thronged its hotels and public automobile grounds. Anticipating this holiday visitation, you will recall that we arranged with the Secretary of War for the temporary loan of 500 Army blankets to use in providing adequate sleeping facilities for parties requiring accommodations at the various hotels of the park over and above the maximum equipment available. The blankets were procured from Camp Lewis, and enabled the park administration to meet every demand for bedding.

This, it seems to me, is an excellent example of what can be accomplished in the way of cooperation between Government departments in the interest of the people.

Reverting to the topic of week-end travel, I had occasion to enter the park on two Sunday afternoons in August, and I was astounded to see the number of automobiles on their way out of the reservation. In less than 40 miles I passed over 400 machines.

CONVENTIONS IN THE PARK.

Among the conventions held in the park were the Washington State Bankers' Association, the Knights of Pythias, and Order of the Eastern Star of the State, the West Coast Lumbermen's Association, the Association of Western Confectioners, the Seattle Chamber of Commerce, and the Seattle Rotary Club.

MOUNTAINEERING CLUBS HOLD OUTINGS.

I have already mentioned the outings of the big mountaineering clubs, the Mazamas and the Mountaineers. The former camped on Mazama Ridge, the scene of many happy gatherings of club members in the past. The Mountaineers made a trip around Mount Rainier in the reverse direction of their trip of 1915, which was the first circle tour of the mountain.

Many members of both clubs reached the summit of the mountain and made other trips of unusual interest. The reports of their outings, which will appear later in the year, will be valuable additions to recorded history of the park.

MEMORIAL TO GEN. HAZARD STEVENS.

The Mountaineers propose to erect in the park a memorial to Gen. Hazard Stevens, who died during the past year. Gen. Stevens and P. B. Van Trump were the first to ascend Mount Rainier. The ascent was made in 1870 from a camp near Sluiskin Falls, and it is proposed to erect on this camp site the monument commemorating this event and the interest of Gen. Stevens in the mountain. The form of the memorial has not yet been finally determined, but doubtless it will be a stone bench of appropriate design and suitably inscribed.

WILD LIFE INADEQUATELY PROTECTED.

The lack of a game preserve adjoining the park, especially on the west side, is each year felt more keenly. The deer are not flourishing in the park because they are not protected in their winter feeding grounds on the lower altitudes outside of its boundaries. They are probably not decreasing in numbers, but they are not doing more than holding their own. They are timid and are only seen occasionally by visitors, a situation that is quite unusual when compared with the tameness of deer in most of the other national parks.

A State or county game preserve should be established where these animals need absolute protection at all times of the year, and I trust the authorities having the power to create such a refuge will soon take steps to meet this need. I understand that in the State of Washington the creation of game preserves is not a matter that is generally presented to the legislature.

A BIOLOGICAL SURVEY IN PROGRESS.

Under a cooperative agreement between the United States Biological Survey, the National Park Service, and the State College of Washington a study is being made of the mammals, birds, and life zones of the park. The results of this investigation will form the basis for certain scientific papers and a popular publication that will form a part of the natural history series of this bureau. The expedition is in charge of Dr. W. P. Taylor, of the Biological Survey, and Dr. W. T. Shaw is representing the State College of Washington. Park Ranger J. B. Flett is acting as guide and botanist for the party. Dr. William L. Finley, State biologist of Oregon and well-known photographer of animal life, is making still and motion pictures for the expedition.

This work is highly important and ought to be carried forward in other national parks as fast as possible.

LONGMIRE PROPERTY CHANGES HANDS.

For many years the tract of land held in private ownership at Longmire Springs has been a source of annoyance to local officers of the Service as well as to Government concessioners. This tract was acquired by James Longmire under the mining laws many years ago. A hotel was maintained on the tract for a long time, and in connection with this establishment some use was made of the mineral springs on the property. The old plant fell into disuse, and for some years the property was given no attention

by its owners. It became an eyesore and the object of adverse criticism by hundreds of tourists, who were compelled to observe the place as they raised their eyes to Mount Rainier, towering high above the valley.

Every effort was made to relieve this condition, but to no avail. In 1916 the property was improved by lessees, who built a small hotel plant on the tract, but still insufficient consideration was given to the landscape improvement of the grounds. This year, however, I am pleased to report, the Rainier National Park Co., which owns the other hotels of the park and the transportation lines, purchased the lease of property and is now maintaining it in accordance with the terms of its contract with the department governing its privileges in the park.

This places this private holding in a satisfactory status for the present, but ultimately it should be acquired by the Government, as it is in a part of the park where it will always be an active or prospective source of annoyance and interference in the development of the reservation.

The lease obtained by the Rainier National Park Co. will run for a period of years equal to the unexpired term of the company's lease of Government lands in the park in connection with the operation of its hotels and other enterprises. The officials of the company have promised to cooperate with us in the improvement of the tract, and our landscape engineer has submitted some suggestions for their use.

DEVELOP CARBON RIVER NEXT.

The heavy travel to the southwestern portion of the park, which is the only section fully developed with roads, has convinced both the national park service and the Rainier National Park Co. of the importance of developing other sections of the reservation. Logically the Carbon River region should be opened next. It is the key to the northwestern section of the park, and is in a very beautiful area. Four years ago I had a road surveyed up the Carbon River Valley, and each year since, except one year of the war, we have submitted an estimate for the construction of this highway.

The route of this proposed road is up the Carbon River to the Carbon Glacier, a point which can be made the starting point for walking and saddle-horse trips to Spray Park, Mist Park, and Moraine Park, from which most striking views of the mountain are to be obtained. The total length of the road in the park would be approximately 7 miles, but our plans contemplate building 3½ miles additional through the Rainier National Forest to connect with the State highway.

STATE ROAD TO CARBON REGION.

Pierce County recently approved a bond issue of $2,500,000 for the construction of many miles of paved road. One of the projects comprehended in this bond issue is the completion of a paved automobile road to Fairfax, 5 miles from the park boundary, within two years. This work will be continued to the forest boundary, declare resolutions recently proclaimed by the commissioners of the county.

Thus within two years paved roads will lead almost to the northwestern corner of the park. The time has come when we would have to build up the Carbon River Valley as a measure of cooperation with the county in this big road enterprise if the more pressing need of developing the upper valley in the park as a tourist resort did not exist.

The road from the forest reserve line to the neighborhood of the Carbon Glacier, approximately 11 miles, will cost $100,000.

HOTEL WILL FOLLOW ROAD.

As soon as the Carbon River road is completed the Rainier National Park Co. will be in a position to undertake the establishment of facilities for accommodating the traveling public. A hotel site has already been selected.

A PAVING PROGRAM SUGGESTED.

The bond issue of Pierce County also covered the paving of the Nisqually approach road to the park entrance. About half of this road is paved at the present time. When this splendid improvement is complete travel over the road may be expected to grow to many times its present volume. This prospect invites the question whether we ought not soon to plan the paving of part of the park highway, at least to Nisqually Glacier, and the widening of the road to Narada Falls and Paradise Valley.

AN IDEAL ROAD SYSTEM OF THE FUTURE.

The White River road, in the northeastern section of the park, was closed to traffic this year because of lack of funds to make necessary repairs. It is 10 miles in length and was built by a mining company operating in Glacier Basin. Two years ago approximately three miles of the road was realigned and widened, and the remaining portion of the road must be similarly improved before it will be a good automobile road. This work should be undertaken next year, as the McClellan State highway will be completed to the White River entrance of the park. Ten miles of the road are still to be finished, but the work is in progress and will be finished early next season.

After the White River road is improved and the Carbon River road is completed to the glacier we may properly suggest the construction of the first link in a road around the mountain. This would leave the Nisqually road near Narada Falls and proceed through Stevens Canyon to the Ohanapecosh River region at the southeastern corner of the park, thence up the river and Chinook Creek to Cayuse Pass—a distance of 28½ miles. Eight miles farther on, such a road would connect with the White River road.

Following the building of this highway, the route connecting the Carbon and Nisqually roads naturally would be adopted for the next project. This would leave, as the last section to be completed, the road between Glacier Basin and the Carbon River district.

Here is a broad scheme of development that should be carried out without the loss of a year's construction work; and, after all, in

these days of enormous road-building projects, this has no unreasonable or impracticable features.

TRAILS TO KLAPACHE RIDGE.

The only trail built during the year afforded a side trip from the west-side trail system. It ascends Klapache Ridge north of St. Andrews Creek and then continues on this eminence to St. Andrews Park.

OHANAPECOSH HOT SPRINGS.

I renew here my recommendation of last year, that the lines of the park be extended to take in the Ohanapecosh Hot Springs. This would add only a very narrow strip to the park. The springs have great possibilities of development for the benefit of the public, and it would be our policy to develop them in a way that would give tourists the best and freest use of them consistent with their proper upkeep.

Some other minor adjustments in the south boundary should be made in legislation providing for the inclusion of the hot springs.

On April 16, 1919, Supt. D. L. Reaburn, who had been in charge of the park since June 1, 1915, was granted, at his request, an indefinite leave of absence, and Mr. Roger W. Toll, of Colorado, was appointed as his successor. Mr. Toll has had many years' experience in mountaineering in the national parks, and his education and training peculiarly fit him for the new work he has undertaken. He has long been a member of the Colorado Mountain Club. His volume entitled, "Mountaineering in the Rocky Mountain National Park," was issued by the National Park Service early in the summer.

CRATER LAKE NATIONAL PARK.

The most important feature in the development and administration of this park this year was the completion, after several years' work, of the road around the rim of the lake. This was finished and opened to the public on August 2. I made this trip of 35 miles soon after the road was opened and found it a wonderful scenic tour.

ENGINEERING WORK TRANSFERRED.

Prior to this season the engineering work of the park has been under the direction and control of the Corps of Engineers of the Army. The sundry civil act of July 19, 1919, transferred this work to the National Park Service. All property and equipment of the Engineer Corps that was purchased with park funds have been delivered to this bureau and, anticipating this transfer of control, the Engineer Corps placed the direction of the improvement work in the superintendent of the park at the beginning of the season in order that he might organize a force of employees that would serve the park throughout the working period, and might proceed in strict accordance with his plans for the year's development.

With the transfer of jurisdiction over this engineering project, the Interior Department gained complete control of the last national park in which authority was divided between it and the War De-

partment. All phases of park activity are now harmonized throughout the system, and it is particularly gratifying that we at last have the opportunity to plan future progress in all of the parks in accordance with a uniform policy.

PARK ROADS IN GOOD CONDITION.

While the rim road was somewhat rough in places, especially where construction and heavy maintenance work was still in progress, the general condition of the road system was exceedingly good. By contrast with the approach roads to the park boundaries the state of our highways was especially satisfying.

Improvement work of a permanent nature was continued on the rim drive after the road was opened to travel, and this work will be carried on to the end of the season. This road is one of the finest scenic highways of the world. Not only are the views of the marvelous lake superb and unique, but the glimpses of the surrounding region that falls away from the crater are only slightly less sensational.

TRAILS SUPPLEMENT RIM DRIVE.

In order to give the visitor even more thrilling views of Crater Lake or the adjacent mountain region than that afforded at the points where the Rim road overlooks cliffs of the crater, trails were built this year from the road to Sun Notch and Crater Peak.

A PAVING PROGRAM ESSENTIAL.

Because of the nature of the soil in Crater Lake National Park, which in many places is either a volcanic ash or volcanic sand, in many stretches of the road natural surfaces are impossible to maintain. Where the road surface is a volcanic-ash soil it rapidly breaks up under automobile travel and becomes a finely pulverized and almost impalpable dust, which, when dry, flows much like Portland cement, filling the ruts and chuck holes so that to the eye they appear fairly smooth, yet offering no cushion to absorb the shock of the rut or chuck hole. Much of this dust is puffed into the air by the wheels of the automobile, where it remains in suspension for a long time, filling the eyes and nostrils of the occupants of automobiles, and often obscuring the view.

The sandy soil is of a very friable nature and impossible to pack or consolidate, and as a result many automobiles get stuck when these sandy stretches occur on hills, as is the usual case. That these conditions would exist was known in advance of the construction of the road system, for the roads at Crater Lake were built by the Engineer Corps in accordance with the scheme or project outlined in House Document No. 328, Sixty-second Congress, second session, in which provision was made for surfacing the entire system of roads with macadam, and the construction and maintenance of a sprinkling system to keep the macadam roads in repair and free from dust. During the first season of actual road construction short stretches of experimental road surfaces were laid, and it was developed that an oil-bound macadam, which was about as cheap as water-bound macadam, satisfactorily withstood travel demands, while the water-bound macadam did not.

Much of the 57 miles of road constructed is in material that with a reasonable fund for maintenance can be kept in a fair condition for travel, but perhaps half of this mileage is in need of permanent surfacing, which is the best and only economical method of maintaining it. Certain short sections of the road that are in most need of surfacing should be surfaced each season until all of the bad sections are thus improved, and in line with this idea I have included in the estimate for 1921 an item for surfacing 3 miles most in need of this treatment.

APPROACH-ROAD NOTES.

The State road leading to the park from Medford was in unusually bad condition this season, inside and out of the Crater National Forest. The section around Prospect was the worst part of the highway. The State is now working in this region on an entirely new road, but little was done to keep the present road in anything approaching proper usuable condition. With the very heavy travel of this year it became deeply rutted and terribly dusty.

If Crater Lake National Park is to be developed as a resort for motorists, these approach roads must be quickly rebuilt or repaired. The war, of course, has delayed this improvement work, but now that State and Federal aid funds are available, it should be rushed to completion. As we pointed out in previous reports, the counties of Klamath and Jackson have repaired these roads to the limit of their finances, and Jackson County citizens have even made personal subscriptions of considerable sums of money for this work. More can hardly be expected of them.

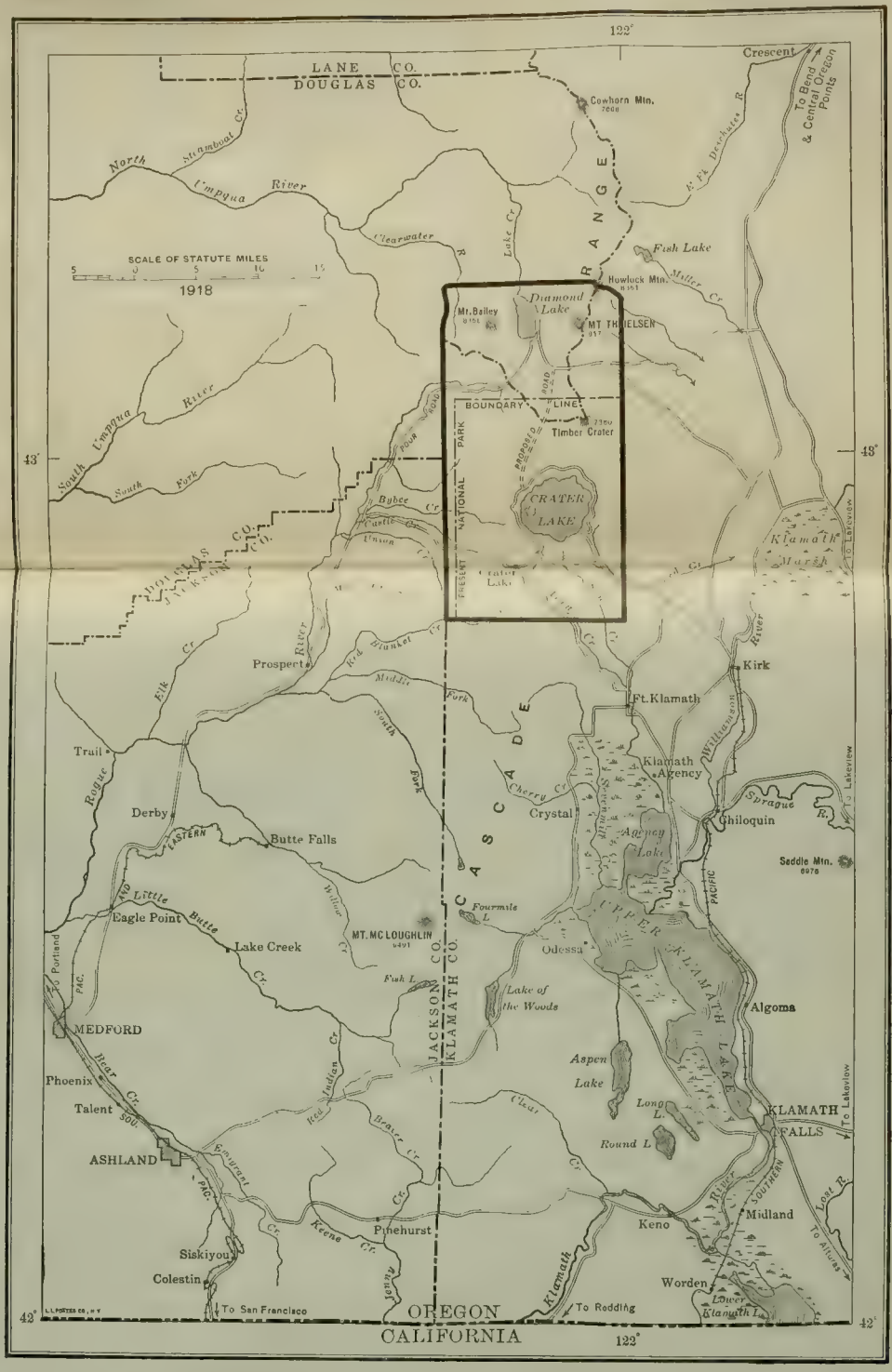
HOTEL SERVICE SOMEWHAT IMPROVED.

The service furnished at Crater Lake Lodge was somewhat better than last year, although facilities are not what they should be, and I again emphasize the necessity for the people of Oregon to give to the owners of this property their financial and moral support in bringing the enterprise to an operating basis that will insure proper treatment of tourists visiting this beautiful national park.

There was much demand for boating and fishing on the lake during the season. The Crater Lake Co. bought a large number of boats, but they did not reach the park until late in the season.

NATIONAL EDITORIAL ASSOCIATION AT CRATER LAKE.

On August 11 nearly 400 members of the National Editorial Association visited the park, and I happened to reach Crater Lake the same day. This big party was far larger than the ordinary hotel facilities at the crater rim could accommodate, but the chambers of commerce of Ashland and Medford furnished additional blankets and other equipment, and the superintendent of the park contributed a supply of tents to the emergency camps, thus making it possible to reasonably well care for these excursionists for the one night they spent in the park.



MAP SHOWING THE PROPOSED ENLARGEMENT OF THE CRATER LAKE NATIONAL PARK.

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DIAMOND LAKE ADDITION.

The Diamond Lake country to the north opens out to the view of the traveler around the rim, and the importance of adding this section to the park can be readily seen. The construction of a road from Diamond Lake connecting with this rim road would be a very simple matter, following the route of the present trail, and with the development by the State and county authorities of the road from a point south of Crescent, on the Central Oregon highway east of the Cascades, a new entrance into Crater Lake National Park would be developed. This would be very useful to the people of Oregon, and particularly to tourists coming to the park via The Dalles and Bend.

Camping facilities around Diamond Lake are excellent, and the addition of this section would add materially to the park's usefulness. Last year Senator McNary, of Oregon, introduced a bill providing for this enlargement of the park, but it was not reached in the Sixty-fifth Congress. He reintroduced this legislation on August 15, 1919, as Senate 2797, and I earnestly hope that this bill will be enacted into law this year in order that we may begin the development of the Diamond Lake region next season.

ROCKY MOUNTAIN NATIONAL PARK.

In 1917 and 1918 Rocky Mountain National Park held the record for tourist travel to the big scenic parks of the Western States, but this season it takes the first place of the entire park system as a tourist resort, having passed Hot Springs Reservation by a safe margin. Its travel for the season just closed reached the amazing total of 169,492. While this is necessarily an estimate, it is based on a careful count of visitors entering the Estes Park and Longs Peak gateways, and a reasonable allowance for travel in the early mornings and evenings, before and after checking could begin, and a similar conservative allowance for travel via the western or Grand Lake entrance. Lack of funds for the employment of temporary rangers for traffic control at all the gateways prevented the making of an absolutely accurate count of all visitors such as is made in nearly all of the other parks of the system.

ALL HOTELS CROWDED.

This enormous travel has clearly demonstrated that if Rocky Mountain National Park becomes more popular than it now is its hotel accommodations will be wholly incapable of meeting the public demand for service. There are enough hotels in or adjacent to the park to accommodate more than 200,000 people if they should come and stay only an average period of two or three days; but such is not the use that is made of this splendid reservation. Visitors, generally speaking, want to spend a long time in the park, resting about the comfortable hotels, fishing, mountain climbing, or traversing the trails on foot or horseback. Motoring, of course, is limited on account of the relatively small road mileage. The superintendent reports that most of the accommodations of the hotels in and near the park were reserved for the remainder of the season very shortly after it opened.

Rocky Mountain National Park is, therefore, not only the most popular as well as the most accessible park in the Western States, but it is the greatest all-summer resort park of the system. It holds an enviable position from the standpoint of public esteem and national use.

LITTLE CONSIDERATION FROM THE GOVERNMENT.

In spite of this fact, which certainly can not be denied or seriously questioned in the face of the travel figures of this and preceding seasons, this great park has received only slight consideration from the Federal Government since it was created on January 26, 1915. A proviso in the organic act limited the annual appropriations for the new park to $10,000, a sum wholly insufficient from the establishment of the reservation to even properly protect its natural features from fire and other destructive agencies. This limiting provision was kept in force until March 1, 1919,[1] when, by act of Congress, it was repealed. The repealing legislation, however, will not become effective so far as increased appropriations are concerned until the next fiscal year, no additional funds having been made available for the present season. Nevertheless, the future of the park became infinitely brighter by the removal of its chains, and we may now plan its broad development with reasonable assurance that our program will be carried out through the appropriation of adequate funds by Congress.

It is, therefore, proper to state that the repeal of this inhibition on the park appropriations was the most important event of the year so far as the progress of the park is concerned, and that even the very gratifying increase in its travel is hardly on a par with the repealing legislation as a feature of the year's record in park history. The legislation is a landmark that will ever be second in importance only to the establishment of the park itself.

IMPROVEMENTS TO COME.

Now that we are free to begin the larger development of the park, the question arises as to what are the first projects to undertake. Clearly the first thing to do is to provide a larger protective force for the care of the reservation, not only in summer but also in winter, when special attention must be given to the protection of wild life from poaching. Next in importance is the purchase and installation of equipment and materials for general repairs to park improvements and the undertaking of new projects. We have no tools to work with in the park except a limited supply of fire tools and telephone and trail repair equipment. A machine shop, a stable, a storehouse, and a garage must be erected and equipped, and road, trail, and other machinery and tools must be procured.

Next the existing roads must be repaired and improved. These highways are all in a state of serious disrepair, due to lack of available State funds for their upkeep this year and the deteriorating effects of extremely heavy travel in an exceedingly dry season. The State is arranging to relinquish the care of these highways to the

[1] See text of repealing law on p. 1218

National Park Service, with the exception, of course, of the Fall River Road, above Horseshoe Park, which it will continue to maintain until the two ends of the road are connected on the summit of the mountains and this transpark highway is ready for delivery to the Federal Government in a finished state, in accordance with the State's agreement.

The roads that will need immediate repair next season will be the Fall River Road to Horseshoe Park, the High Drive, the Moraine Park Road and its extensions to Glacier Basin and Mill Creek Ranger Station, and the Longs Peak Highway, and certain other short stretches of road used by motorists to a considerable extent, about 60 miles in all.

There are also numerous trails and several important links in the telephone system that must be repaired as soon as additional funds are available. However, all of this repair work should be accomplished next year.

ROADS FOR TRAIL RIDGE AND FERN LAKE.

Aside from the new buildings that must be built, work on certain other construction projects should be commenced next year. These projects include a road on Trail Ridge to connect with the Fall River Road and forming a Y with its connecting highway, a road which may ultimately be extended down Windy Gulch from the top of the mountains to Moraine Park. As a Y on Trail Ridge, however, this new highway would be one of the most scenic highways in the park system. The views of the surrounding mountains from this route are superb. With the construction of this one road, the popularity of Rocky Mountain National Park as a resort for motorists should greatly increase.

Other roads that should be constructed in part next year include a continuation of the Moraine Park Road to Fern Lake, and a road along Aspen Brook, west of Gianttrack and Lily Mountains, to a junction with the present road from Estes Park to Longs Peak Inn. The former would open to the motorist the beautiful Fern Lake region, and would make this section more accessible in winter. The winter carnival is held at Fern Lake each year. The latter road would provide a more scenic highway to the Longs Peak district, and would be an additional advantage in that the road would be entirely in the park.

NEW TRAIL DOWN POUDRE RIVER.

An important new trail projected for early construction would follow the Cache la Poudre down to the northwest corner of the park. Ultimately, of course, a road will follow this trail route, and connect with the Fall River Road probably at the head of Chapin Creek Canyon.

A new telephone line across the park to Grand Lake will be the first step in the development of this communication system.

New gateways and other landscape improvements of a relatively inexpensive nature complete the program for next year's work as it has been approved so far. The total estimates call for an appropriation of $150,000 for the fiscal year ending June 30, 1921.

FALL RIVER ROAD NEARS COMPLETION.

The transmountain road to connect Estes Park and Grand Lake, which has always been known as the Fall River Road, will be completed about July 20, 1920, if weather conditions permit early resumption of construction work. In accordance with our recommendations the State of Colorado, which is building this road under an agreement made at the time the park was created, changed the route of the highways late last year, and it is now being finished on the survey along Trail Ridge to Poudre Lakes instead of the alternative route down Chapin Creek and up the Cache la Poudre River to the lakes and Milner Pass. The route being followed is far shorter and much more scenic than the Cache la Poudre route.

It was expected that the road would be finished this year, but adverse labor conditions prevented the accomplishment of the work planned by the State Highway Commission, although the chairman of the commission, Hon. E. E. Sommers, gave this project his personal attention in view of the urgent need for this highway as a means of crossing the park by automobile. However, the work actually accomplished during the season is more important than statistics relating to it would make it appear. This is because both ends of the road have been brought nearly to the top of the mountains, thus leaving little more than the light construction along the relatively flat summit to bring the ends together.

Climbing to the top on both sides of the range, the highway commission this year completed 9,145 feet of the road on the east side, leaving less than 5,000 feet to finish in order to reach the level section on the summit; and on the west side it completed 19,100 feet, leaving only 2,800 feet to finish before the summit is attained.

Before withdrawing its crews after completing construction work the State will repair and improve the lower part of the Fall River Road on the east side, making some sections and curves wider, reconstructing parapets and retaining walls, and clearing the highway of small rocks.

APPROACH-ROAD IMPROVEMENT.

Outside of the park the State is expending large sums of money in widening and improving the Big Thompson and South St. Vrain approach roads. One hundred and ten thousand dollars is being spent on the Big Thompson Road. I have no advice as to the amount that will be spent on the South St. Vrain Road, but it will be a large sum because the plans of the highway commission contemplate double tracking the road through this granite gorge.

The State has been handicapped in all of this road work by repeated washouts which have necessitated expenditure of funds on temporary bridge and other repairs on all approach roads, including the North St. Vrain approach from Lyons, a road used largely for freight and hurried trips from Denver to Estes Park, which was badly injured by a washout early in August. Taking everything into consideration, the State of Colorado has rendered the National Park Service this year as much cooperation as any western State, and by next season will have accomplished road improvement that will be of enormous importance to Rocky Mountain National Park

and hence to the entire country, because of the national travel to the park which will benefit by these achievements. It behooves the Federal Government certainly to do as much for the park hereafter as the State is doing in its behalf.

COLORADO MOUNTAIN CLUB OUTING.

The Colorado Mountain Club, the great out-doors organization of the Rocky Mountains, which has its headquarters in Denver, held its annual outing in the Wild Basin in August. With the members of this club were several members of the Prairie Club of Chicago. These mountaineers climbed several of the highest peaks of the park and explored many of the wild and little frequented sections of the reservation. The trip was a thorough success.

THE WINTER CARNIVAL.

In February, in line with now-established customs, members of the Colorado Mountain Club and their friends held their winter carnival at Fern Lake. Skiing, skating, snowshoeing, and other sports were made especially enjoyable because of very favorable weather conditions.

Rocky Mountain National Park has a great future as an area for winter sports and as more funds become available for the installation of better facilities for these sports I hope to develop them on a large scale, thus definitely bringing this park into the chain of national parks that may be used as effectively in winter as in summer.

BETTER TRANSPORTATION FACILITIES.

In April, 1919, the department entered into a 20-year contract with the Rocky Mountain Parks Transportation Co., covering the operation of transportation and garage service in Rocky Mountain National Park. This company had been giving service to the public, and particularly to the citizens of the village of Estes Park and its surrounding region, for several years without any aid or encouragement from the Federal Government. This service had been rendered both winter and summer without regard to weather conditions or volume of traffic. Except during the tourist season it operated from railroad points to Estes Park and vicinity without competition. During this part of the year the company was unable to make a profit even under the best weather conditions. During the tourist season of the year scores of automobile owners who were subject to none of the hazards of other months of the year brought their cars to the park and operated them in competition with the transportation company, undercutting the company's rates when cars were plentiful, and charging excessively for all service rendered when cars were scarce, and never making any effort to obey the traffic rules of the park. The results of this unrestricted and irresponsible competition brought the transportation company face to face with the alternative courses of continuing its operations to the point of financial breakdown or withdrawing its equipment and disposing of it in the automobile market.

It naturally chose the latter course, and it was to secure the continued maintenance of its efficient service that we decided to make it the official transportation line, under a contract which required it to

furnish service as prescribed by us and at rates approved here. This agreement was entered into with the mutual understanding that whenever it should fail to furnish enough equipment to meet the demands of the public, or in other manner should not give adequate service during a tourist season, another responsible transportation line, or more than one if necessary, should be admitted to the park to supply the needs of the public.

Under this contract the company furnished excellent service. It gave every class of service to meet the tourist requirements, and at rates approved by us. The service was dependable and was a great benefit to the park and to those who came to enjoy the motor trips that were available within its boundaries. Likewise, thoroughly reliable service was rendered from railway points, including Denver, at rates prescribed by this bureau, regardless of the fact that our control of traffic stopped at the park line. In other words, so far as rates were concerned, the company voluntarily placed all of its business outside of the park under our jurisdiction for the protection of the public.

Certain parties have not been satisfied with this arrangement, and have sought to restore the old conditions, but these efforts have been unavailing.

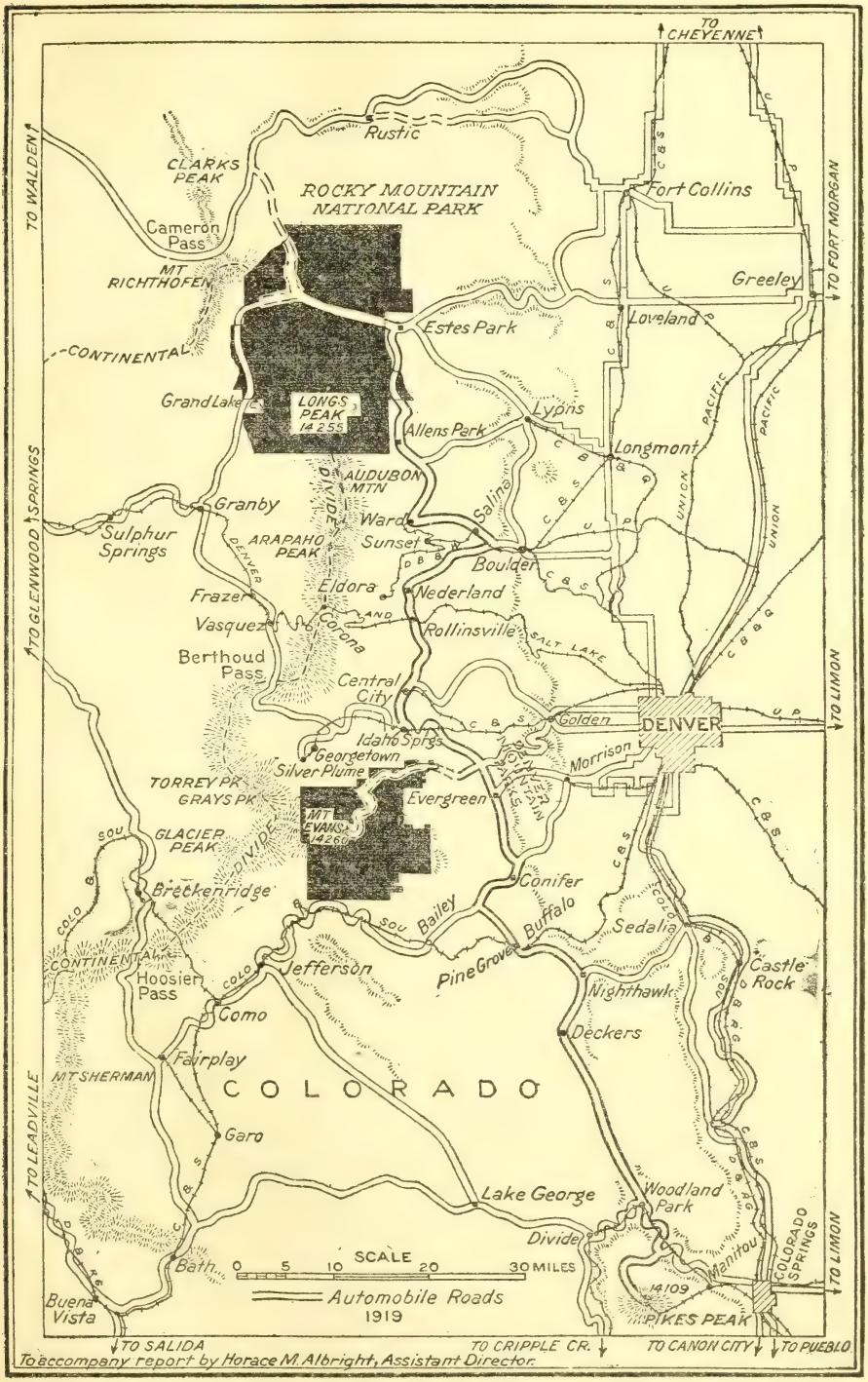
ADD MOUNT EVANS TO ROCKY MOUNTAIN PARK.

The next legislation that should be enacted with reference to the park, aside from appropriation measures, should provide for the addition of the Mount Evans region to the park area. A bill providing for this extension was introduced in the last session of Congress but was not brought up by its proponents. It is expected that other legislation to accomplish this purpose will be introduced again in the early future.

Briefly, this project contemplates giving a park status to the remarkable section of the Front Range almost directly west of Denver, which in reality is simply Mount Evans, highest peak in the Front Range, and its great buttresses. Mount Evans rises 14,260 feet above the sea. To describe it adequately would require more space than this limited report will allow, but it is sufficient to say that, with the exception of Mount Rainier, the national park system does not include a mountain that is so well proportioned and so distinctive in all of its features as Mount Evans.

Former Assistant Director Albright made a thorough examination of this proposed park area last October, when he climbed to the summit of Mount Evans and covered most of its valleys. In his comprehensive report he describes Mount Evans as follows:

"Mount Evans is the central pile of a vast cathedral-like structure. From the northeast it is supported by a splendid buttress of peaks whose connecting slopes an automobile highway will ultimately skirt. Squaw Mountain, 11,470 feet; Chief Mountain, 11,710 feet; Warrior Mountain, 11,270 feet; Devil's Nose, 11,100 feet; Goliath Peak, 12,200 feet; Mount Rogers, 13,330 feet; and Mount Warren, 13,300 feet, lead progressively to Mount Evans's supreme summit, whose altitude is 14,260 feet. The northwestern buttress is shorter but nobler in its elevation—Sugar Loaf Peak, 12,513 feet; Mount Gray Wolf, 13,610 feet; and Mount Spalding, 13,890 feet.



MAP SHOWING PROPOSED MOUNT EVANS REGION ADDITION TO THE ROCKY MOUNTAIN NATIONAL PARK.

Up from the southeast another noble buttress has for its high points Meridian Hill, 11,000 feet; Rosedale Peak, 12,200 feet; Rosalie Peak, 13,575 feet; and Epaulet Mountain, 13,500 feet. Another buttress joins Mount Evans from the south and contains Mount Logan, 12,730 feet, and several other unnamed eminences over 12,000 feet in altitude. Upon the west Evans is supported by Mount Bierstadt, a monster of 14,046 feet.

"It requires no imagination to picture this system in its architectural proportions. And all within a compact area of 160 square miles."

The Mount Evans region abounds in animal life, and its trees, wild flowers, and shrubs represent a wide range of Rocky Mountain plant life. The lakes of its glacial valleys are very beautiful. Commercially the region is worthless, aside from certain grazing lands that are now and always should be preserved as range for game.

EXTENT OF MOUNT EVANS REGION.

The total area of the proposed extension is 159.34 square miles, or 101,981.83 acres. The area of the present park is 397.5 square miles, or 254,327 acres. Mount Evans lies within the Pike National Forest, which has an area of 1,256,112 acres; hence only about 8 per cent of this reserve is involved in the extension plan.

DENVER PLEDGES AID.

The city of Denver is extending its Mountain Park road system toward Mount Evans, and already a remarkably scenic approach road is built practically to the northeastern corner of the national-park area. It should be continued to the top of Mount Evans, which offers a feasible route along its northeastern buttress, an array of peaks with exquisite lakes in their ice-eaten cirques that will make the suggested road unique among the highways of the world.

Denver has also agreed to acquire all of the private holdings in the park area that are needed for administration or improvement purposes.

There is a great opportunity here to expand Rocky Mountain National Park and its usefulness to the Nation with the cooperation of a city which has already taken a surpassing interest in national-park development.

MESA VERDE NATIONAL PARK.

Mesa Verde National Park has moved steadily forward during the past year. Improvements of a permanent nature have been completed and more have been undertaken with the slightly increased appropriations that Congress has been making available for this exceedingly distinctive park. Travel, however, has not materially increased, due to restricted railroad advertising and uncompleted reconstruction work on the main automobile highways. Nevertheless, there has been a sufficient increase in the number of visitors to make this season the best the park has ever had.

NEW ROAD ASCENDING THE MESA.

The most important improvement project completed this season was the new road ascending the Mesa Verde from the east side of

Point Lookout, which towers far above the Mancos and Montezuma Valleys, among the fairest and richest of Colorado's farm lands. This road was constructed in order to provide a safer means of access to the mesa park than the old highway, which took its narrow, tortuous course along the north and west slopes of Point Lookout and through a body of constantly sliding rock and dirt. The new road is wide and well graded, with no sharp curves, and with a maximum grade of 8 per cent. The new road is scenic and was built to give the traveler every opportunity to view the mountain landscape that is spread out on all sides. Fortunately, the old road on the opposite side of Point Lookout was also in fair condition for travel this season, and thus afforded visitors the chance to come in one way and go out by the other route, a pleasing variation of the park tour.

It is to be hoped that these diverse routes can be used every year, and I am of the opinion that for this purpose it ought to be our policy to maintain the old Point Lookout road in good repair if funds can be made available for the necessary work of upkeep of the highway and control of the menacing slide.

WONDERFUL SECTIONS OF PARK INACCESSIBLE.

Now that there is convenient and safe access to the Mesa Verde, and other urgent improvements in the highway system have been completed, we are certainly justified in planning further development of the park by road extensions. The topography of the park and the scenic features of the Mesa Verde would suggest two new highway routes if there were no more prehistoric structures worthy of being made accessible to the tourist. However, both of these routes would also open exceedingly worth-while exhibits of ancient architecture. One follows the higher or north rim of the mesa almost to the western boundary, then turns in a southerly direction over the Wetherill Mesa to the Rock Springs group of ruins, a remarkable aggregation of mounds and cliff dwellings. A road built on this route would be 17½ miles in length.

The other route leaves the present road system below Spruce Tree Camp and proceeds almost due south to the south boundary of the park, beyond which it would connect with the Cortez-Shiprock highway. A road following this route would greatly facilitate access to the interesting Indian country to the southwest, and would ultimately become one of the most important links in a park-to-park highway connecting our parks and monuments of the Southwest.

Both of these roads should be built in the very early future, and I am so thoroughly convinced of their importance in the advancement of interest in Mesa Verde Park that I am preparing estimates for funds to cover grading them next year.

A third road that should be built soon is a short lateral to the summit of Point Lookout. It would be about 1 mile in length.

SCENIC TRIP TO MESA VERDE.

With or without these new roads, the trip to and through Mesa Verde Park is one that every American should take. The scenic railroad approaches can not be surpassed in this or any other country, and the automobile highways leading to the park already built or

in course of construction are equally impressive. The natural features of the park itself are distinctively scenic, and, of course, it is remarkably unique because of its ancient buildings and relics of a past civilization. Everything about the Mesa Verde combines to make it one of our finest parks, and hence worthy of the best attention of the Federal Government.

ARCHÆOLOGICAL WORK RESUMED.

Since Dr. J. Walter Fewkes, chief of the Bureau of Ethnology, United States National Museum, excavated Far View House in the Mummy Lake group of ruins during the summer of 1916, no further archæological studies have been made in the park because of lack of funds.

This year, however, Congress appropriated sufficient money to enable us to undertake the excavation and repair of Square Tower House, one of the most remarkable cliff dwellings of the park, and which has been in danger of total collapse during the past three or four years. Excavation and exploration of this ruin were earnestly advocated in our annual reports of 1917 and 1918 as the most important archæological work to be undertaken. With the funds now available Dr. Fewkes is engaged in restoring Square Tower House to a state of security that will be comparable with the condition of Cliff Palace, Spruce Tree House, and other famous cliff dwellings which were excavated and repaired soon after the park was established. The results of Dr. Fewkes's investigations are not available for discussion in this report, but they will later be given to the public by the Smithsonian Institution and through special bulletins of the National Park Service.

CONTINUING EXCAVATION PROGRAM ADVISABLE.

The excavation of the ruins of Mesa Verde Park should be continued systematically. A definite program contemplating progressive studies of cliff dwellings and mounds, under which are buried the ruins of ancient pueblos, should be adopted, and each year funds should be made available for carrying out this policy. Not only would this work be distinctly in the interests of the traveling public, but it would result in annually contributing to the science of archaeology and related sciences technical data of incalculable value. It would attract students from all parts of the world. I can not urge too strongly the fact that there can be no better time than the present to enter upon the execution of a policy of this kind, because Dr. Fewkes, who knows more about the Mesa Verde ruins than any living man, is available to personally supervise and direct the field work, and having renewed his close connection with the park's affairs with the excavation this year of Square Tower House he should be given the opportunity to continue his work without further interruption.

PROPOSED YUCCA HOUSE NATIONAL MONUMENT.

Closely related to the archeological work in progress in Mesa Verde National Park is the preservation of the Aztec Springs Ruins, which are located a few miles west of the park on the edge of the

Montezuma Valley. These ruins have long been reported as among the finest in the Southwest and undoubtedly constitute a most valuable field for scientific research. Until recently they were owned by Mr. Henry Van Kleeck, of Denver, Colo. He has, however, deeded them to the Federal Government under the act of June 8, 1906, to be preserved forever as a national monument.

Dr. Fewkes has proposed that the monument be called the Yucca House National Monument. It is located in the foothills of Ute Mountain. The Tewa Pueblo Indians who claim that their ancestors lived in Montezuma Valley, call Ute Mountain by a name meaning Yucca Mountain. They gave it this name on account of the abundance of these plants that grow on its sides. Montezuma Valley is called by them the Valley of the Yucca Mountain. While the name Aztec Springs ruin has the advantage of usage since 1875, the use of Aztec should be avoided, as it leads to confusion with the great ruin near Aztec, N. Mex., and implies the erroneous theory of a relation with the Aztecs of Mexico. Also Aztec Springs House Monument, or Aztec Springs Ruin Monument is a cumbersome title.

As these ruins were not built or used by the Aztecs, the name "Aztec Springs" long applied to them is a misnomer.

HOVENWEEP MONUMENT NOT YET ESTABLISHED.

In my latest report I considered in some detail the advisability of a national monument to include the prehistoric towers and castles of the Hovenweep district northwest of Mesa Verde National Park and approximately on the Colorado-Utah boundary line. Lack of surveys by which definite boundary lines might be described has delayed the establishment of this monument, but it is highly important that these remarkable ruins be preserved by the National Park Service. As soon as possible they will be brought under our jurisdiction in accordance with the provisions of the national monument act.

MESA VERDE RESEARCH HEADQUARTERS.

Situated in proximity to such important ruins as those of Aztec Springs and the Hovenweep district, Mesa Verde, with its own vast number of unexplored structures of antiquity, becomes a center for extensive research work of the future. It is my hope that it may not only be the resort of thousands of tourists but also a field of investigation for all scholars interested in the works and customs of the vanished peoples of the Southwest.

GRAND CANYON NATIONAL PARK.

The Grand Canyon of the Colorado, which has been a national monument since January 11, 1908, and administered by the Forest Service of the Department of Agriculture, has at last been made a national park. The first bill providing for the enlargement of this park was introduced January 5, 1885, by Benjamin Harrison, then a Senator from Indiana, and legislation to accomplish this purpose has been pending almost continuously since that time. The final and successful measure was introduced by Senator Ashurst on April 4, 1917, passed the Senate May 16, 1918, and the House of Representa-

tives on January 20, 1919. It was approved by the President on February 26, 1919,[1] and while this action of Congress has in the minds of many been needlessly delayed I feel that the American people should accord to Congress and to those who so untiringly advocated the creation of the park and assisted in its establishment great credit for preserving for the Nation this gigantic masterpiece of Nature.

The Grand Canyon is so well known in this country and abroad that its description by me would be superfluous. It is sufficient to say that the National Park Service accepts this charge with the thorough resolve that it will administer and improve it in the best interests of the American people.

DEDICATION OF THE NEW PARK.

The new park should be dedicated this year if possible, and I am hopeful that the proper ceremonies can be held soon. From the standpoint of weather conditions it would be most advantageous to conduct these ceremonies in November. Furthermore, at that time there would be more likelihood of our securing the attendance of some of the men who were instrumental in promoting the establishment of the park, especially the Senators and Congressmen who had the creative legislation in charge.

It would also give us an opportunity to secure the attendance of the surviving members of the second Powell expedition, which had such an important part in the early examinations of the Grand Canyon. The presence of these men would be especially significant and important, because it is one of our principal functions to emphasize wherever and whenever possible the historical background of the parks.

The Powell Memorial, constructed several years ago by the Interior Department, commemorates the discovery of the Grand Cayon and is one of the features of great interest in the new park, but it will mean even more in the history of the region if the surviving members of Powell's party can participate in the celebration of the creation of the park, which would naturally take place in the environment of this monument.

ADMINISTRATION ORGANIZATION FORMED.

Because the National Park Service had no field organization ready to take over the administration of the park, the Forest Service continued at our request to administer its affairs and look after its protection in so far as field matters were concerned until August 15, when Mr. W. H. Peters, an assistant engineer in the Division of Engineering, who had been designated acting superintendent, assumed charge of the park. Since that date much important work has been accomplished. The field organization to control the administration, protection, and improvement of the park is being built up as fast as required and suitable men can be obtained. The task of the present year is difficult, for many things are in need of immediate attention, improvement, and development, and to attend

[1] See text of organic act in Appendix D, p. 1215.

to these many matters requires much thought and action, not only on the part of the superintendent, but others that have to do with the affairs of the park.

EXTENSIVE IMPROVEMENTS REQUIRED.

Grand Canyon National Park is in need of broad development. The most urgent work to be accomplished is perhaps improvement of the present Hermit Rest Rim Road, making it suitable for two-way automobile travel, and the construction of a rim road automobile drive from El Tovar Hotel to Grand View and thence to Desert View; the construction of a comprehensive trail system is equally essential, including a trail to the Colorado River at the confluence of Bright Angel Creek; a trail up Bright Angel Canyon to the north rim; a trail along the north rim from the head of Bright Angel Canyon Trail to Tiyo Point, thence along the rim to the head of Muav Canyon; a trail from Tiyo Point to the Colorado River at the foot of Hermit Trail; a trail down Muav Canyon to the foot of the Bass Trail; and the improvement of the Bass Trail and the Tonto Trail throughout its length, including outlet trails from the Tonto Trail to the South Rim at Grand View and at Desert View. The construction of suspension bridges for horseback travel across the Colorado River at Bright Angel Creek, the foot of Hermit Trail, and at Bass' Cable Crossing, and later on additional trails to develop the South Rim, east to Little Colorado Canyon, and west to Cataract Creek Canyon, are on our program.

A secondary road should be constructed from El Tovar to the floor of Cataract Creek Canyon and the Havasupai Indian Reservation in order to open up to tourist travel the wonderful waterfalls and other beauties of the Cataract region. In many places this would only necessitate small improvements to the existing wagon road, and for a relatively small expenditure many miles of roads suitable for automobile use would be added to the park system of roads, and, at the same time, a section having an entirely different type of scenery of extremely interesting nature would be developed.

The imperative need for the development of the entire area along the north rim is roads. Tourists arriving at Bright Angel Point after traveling long distances find their auto journey ends abruptly. There is no road leading up the river or down from which the most magnificent views of the gorge can be seen. The majority of visitors want to see the river itself and the mile or more of abyss, neither of which is now possible from Bright Angel Point. A large percentage of the visitors are elderly people who can not stand horseback riding over steep, rough trails and for whom the existing horse trails, therefore, hold no allurements. The situation as to roads should be carefully studied without delay, and improvements and construction concentrated on those most urgently needed. These are the roads furnishing the interesting side trips to the most important vantage points from where the inspiring views of the canyon and the odd glimpses of its great beauty en route to Point Sublime and east to the Walhalla Plateau may be obtained.

Later on chalets or camps should be constructed on the north rim at the head of Bright Angel Canyon and Muav Canyon to care for the trail tourists that will use the north side trails when they are

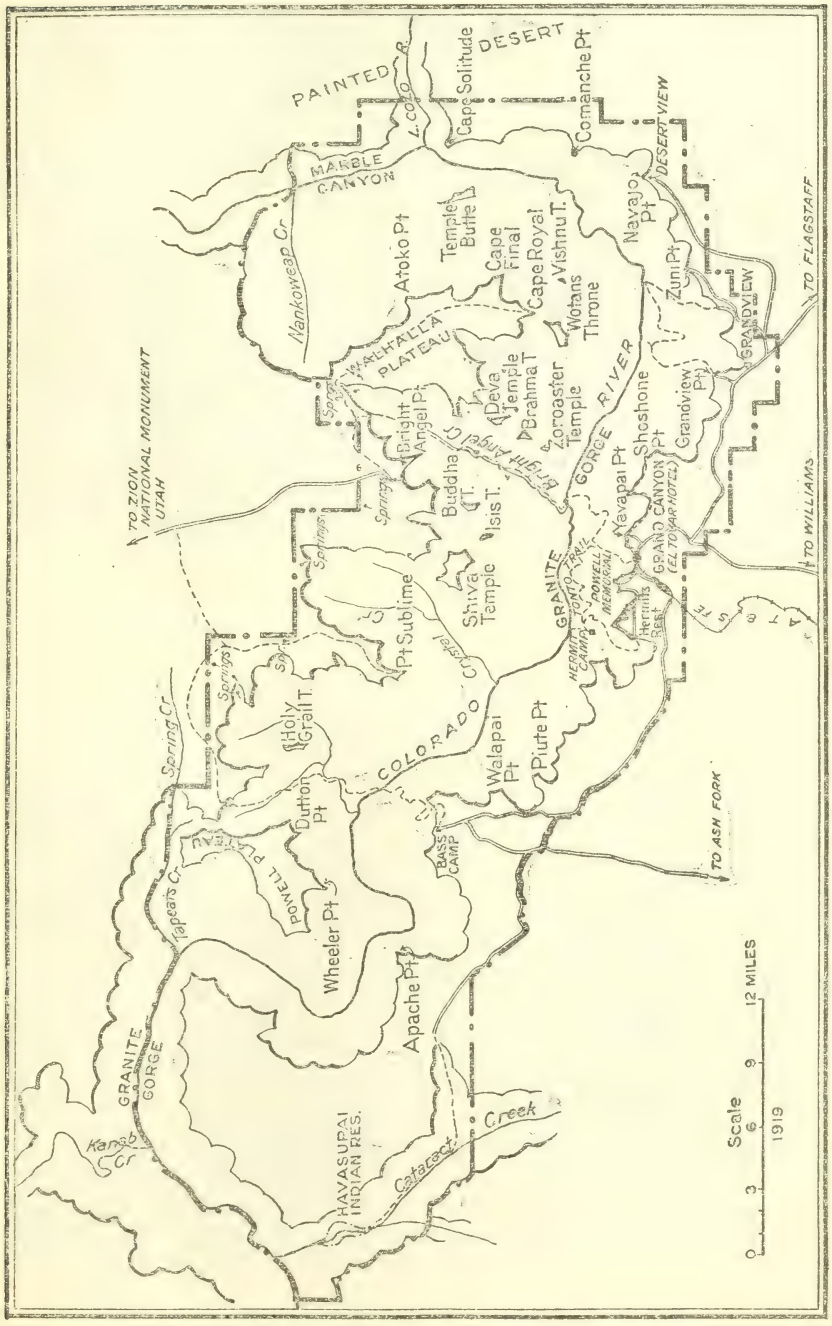


FIG. 1.—MAP OF GRAND CANYON NATIONAL PARK.

built and connected to the South Rim by the horse bridges. It is also quite probable that small tourist camps should be established at the mouth of Bright Angel Creek and at the mouth of Shinumo Creek to assist in caring for this travel. Additional space and facilities should be added to the present Bright Angel Camp to provide an intermediate class of accommodations, which will, in a large measure, relieve any excessive travel demands on the present El Tovar Hotel, so justly termed one of the best tourist hotels in America. Many of the tourists that visit our parks desire hotel accommodations at a lower price than can be furnished at El Tovar, and, on the other hand, want something better than is at present provided by the Bright Angel Camp. It is believed that the demand for this medium class of accommodation is sufficient at the present time to warrant the early action of the concessioners in this respect.

ADMINISTRATIVE VILLAGE BETTERMENTS.

In the vicinity of El Tovar Hotel many betterments should be made to the grounds, and the canyon rim for some distance should be provided with a footpath having a parapet and seats at frequent intervals. The old shacks and débris should be removed from the canceled mining claims, and the buildings that are permitted to remain should be placed in a good state of repair and made to harmonize with the architecture of El Tovar.

Suitable camp sites must be provided and maintained for the automobile tourists that are coming to the park in increasing numbers, and because of the absence of water elsewhere these camps must be in the vicinity of the railroad. Garage and repair-shop facilities must also be arranged for; likewise a general store that will provide tourists and campers with all classes of necessary supplies, such as clothing, food, and general camp and traveling supplies.

Buildings necessary for the administration and protection of the park must be erected and quarters for the construction and maintenance force will be needed. Three buildings of a temporary nature are being constructed this season to serve as a temporary office, storehouse, and mess house, and estimates have been prepared and submitted for the construction of a garage and shop building, a stable, and quarters for a clerk, all at headquarters, and a ranger station for the North Rim, and later on additional ranger stations will be required for both the north and south rims of the canyon. During this fall a thorough study will be made of the surroundings, and plans will be adopted for the best development and arrangement of the administrative site and buildings and the best and most economical type of building for this purpose. It is to be regretted that the stone garage and machine-shop building erected by the hotel management two years ago should be in its present location. The structure is not suitably located for a garage and at the same time it is on or near the site on which the park administration building should be erected. It is believed that it would be to the advantage of both the hotel company and the Government if this garage building might be purchased by the Government and put to park use, and a new garage built near the present horse-transportation buildings of the company or at some other location to be decided on later.

Photograph by National Park Service.

A. BLACKFEET INDIAN CAMP IN TWO MEDICINE VALLEY.

This lovely valley was devastated by forest fires of 1919.

Photograph by Fred H. Kiser.

B. MANY GLACIER AUTOMOBILE ROAD.

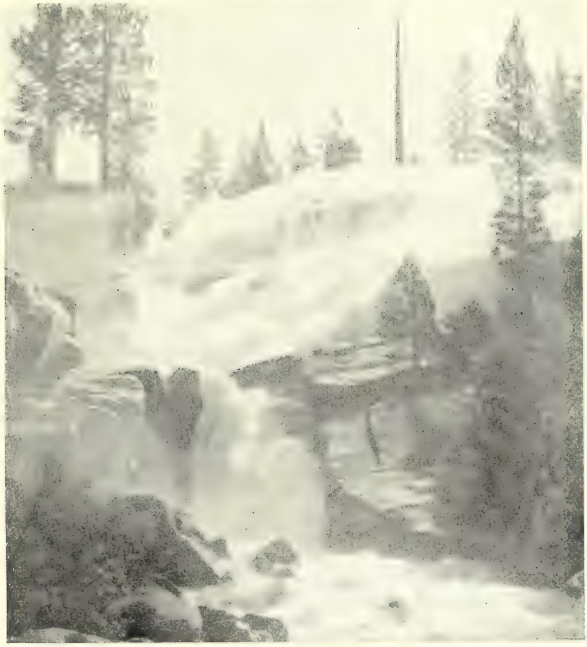
GLACIER NATIONAL PARK.

A. IN THE GIANT FOREST.

Photograph by Lindley Eddy.

B. ENTRANCE TO CRYSTAL CAVE.

SEQUOIA NATIONAL PARK.



A. BUBBS CREEK FALLS.

B. BULL FROG LAKE.

PROPOSED ROOSEVELT NATIONAL PARK.

Photographs by H. W. Gleason.

A. ENTERING ZION CANYON.

B. LIVING IN ZION CANYON.

ZION NATIONAL MONUMENT, UTAH.

Photographs by Douglas White.

WATER STORAGE A SERIOUS PROBLEM.

Some means of securing a water supply for the park administration buildings and public camps must be devised. Preliminary studies of this very serious problem are now being made, and the assistance of the department's geologists will be sought in deciding upon the most feasible method of obtaining water for domestic purposes for the South Rim other than by having it hauled by train from Del Rio, about 125 miles distant, as is done at present. In the meantime an item has been inserted in next year's estimates for the construction of two catchment areas and reservoirs which will determine the feasibility of this method of securing water for drinking purposes, and will at least provide water for stock and sanitary needs.

Water at Bright Angel Point on the North Rim is at present secured from a few small springs, the supply from which during the months of August and September, the dry months of the year, has never been sufficient. At such times water has to be hauled 2½ miles over bad roadways. As these springs are also used for watering stock, the present supply is not sufficient to keep any camping facilities properly provided. This is a serious problem in developing and expanding the facilities at this point. Just recently, however, a spring with an average flow of 20 gallons per minute has been discovered about 200 feet below the rim of the canyon, and within a mile from Bright Angel Point. This may, upon investigation, prove the solution of the water problem in this area. This supply would be kept sanitary and unpolluted by the very fact of its being inaccessible to cattle, and it could undoubtedly be developed by the installation of a pump and pipe line.

Paradoxical as it may seem, the two things that are hardest to obtain in this gigantic water eroded rock canyon are water and rock; for not only is water lacking but also suitable rock for road surfacing, the top strata of the earth's crust being a soft, friable, and easily slacked limestone which, when broken into rock sizes suitable for road surfacing, rapidly disintegrates by weather and travel action. In the surfacing of the present Hermit Rest Road the constructing engineer found it more practical to haul in his road surfacing material. Investigations of possible quarry sites down in the canyon are being made and samples of the limestone are being tested to see if they would make a suitable bituminous concrete rock.

PRIVATE LANDS AND MINING CLAIMS.

Some of the principal administrative problems connected with the development of the park relate to the private holdings and mining claims. Many of the latter that were of a purely speculative nature have fortunately been canceled, and at the time of this writing many other claims of doubtful character and value are coming up for final review before the secretary.[1] Most of the lands in private holdings are situated along the rim of the canyon and are so located that if a rim road is constructed from El Tovar to Desert View it will have to pass over this private property. One owner of such land has already refused to give or sell a right of way across his

[1] See decision of the Commissioner of the General Land Office canceling the Cameron mining locations: Appendix G, p. 1273.

tract. Thus, if it should be decided to build the road condemnation proceedings will have to be instituted. No doubt other similar suits may be necessary.

The Bright Angel trail, which is at present maintained by the county of Coconino, exacts a toll of $1 for every person that rides a horse over it, although pedestrians are permitted to use the trail without charge. The very term toll road or toll trail is abhorrent to the ideals of this Service and contrary to the purpose of national parks, and it is hoped that this toll charge will soon be a thing of the past. Congress has provided in the bill creating the park that a report shall be made as to terms upon which the purchase of the trail and the rights of the county therein can be secured. Such a report will be submitted as soon as negotiations can be had with the county authorities.

NORTH RIM PROBLEMS.

The difficulties in the way of making trips from the south rim to the north rim of the Grand Canyon are serious features of the administration and protection of the park, but when some of the essential trail improvements mentioned above are made this situation will be greatly relieved.

From the standpoint of proper protection of the park quick movement between the two rims is essential. Fire control and the work of looking after the wild animals, particularly deer and bighorn sheep, which are most abundant on the north rim, often create emergencies which must be met by rapid marches of the ranger force. Likewise administrative problems constantly demand the movement of the superintendent from one section of the park to the other, and the earlier we can make it possible for him to make rapid journeys to the north rim from headquarters on the south rim the quicker the very highest efficiency of his office can be attained.

FEATURES OF THE NORTH RIM.

Aside from the animal life of the north rim, the temples of the broken north wall and the forests of the Kaibab are remarkable features of the north side, and the view of the canyon from this side is as magnificent as the view from the south. The north rim is approximately 1,000 feet higher than the south rim.

Late investigations by Mr. Neil M. Judd, of the National Museum, disclose the fact that some of the most interesting ruins of prehistoric structures are to be found along the north rim of the canyon, and just under the rim where sheltering rocks and hidden canyons afforded opportunities to build villages and individual houses and shrines where the inhabitants would be safe from enemies and the ravages of storms.

In fact, an archæological reconnaissance of some of that part of Arizona lying north of the Colorado River and partly within the present boundaries of the park[1] opened up the wonderful possibilities of an intensive study of the prehistoric exhibits available in that region. Here is believed to be found the solution of the puzzle

[1] See the annual reports of the Smithsonian Institution for the years 1915, 1916, and 1918, respectively.

of the history of the aborigines of the Southwest. One of the remarkable observations was the distinction in the types of architecture found in ruins at varying localities. As a result of these studies it is believed that, although similar methods and materials were not always used in constructing these ancient abodes, their builders were related, if not identical, peoples and they possessed a marked affinity with the cliff dwellers of California, Colorado, and New Mexico. Many of the ruins are neither large nor specially attractive; they arrest our attention only when we have a thorough understanding of their significance. The problem confronting archæological investigations, and one of the most interesting encountered in endeavoring to establish some authentic records for these ancient people, is to determine just how definite this relationship actually was. Some existing maps of surrounding areas showing "ancient ruins" are not considered authentic as to location. Knowledge of the definite locations and accessibility of such prehistoric dwellings as are found together with an understanding of their relationship to the great ruins in Navajo National Monument and the Mesa Verde National Park, for example, will add much to the solution of these mysteries of the Southwest. The field for extensive research is unlimited. There are secrets to be divulged for the mere seeking. Every canyon holds possibilities of undiscovered villages.

It must be remembered that not since the days of Maj. Powell has a systematic exploration been undertaken, and Powell did not attempt to unravel the mysteries of the aborigines, where they came from, how they lived, and by what means they solved the problem of daily existence in combat with the elements and enemies. Surely there is no more interesting work than delving into this unknown past and wresting from the soil and the ashes of their camp fires evidences of former life, and from the earth-covered mounds, piece by piece, those shattered exhibits of bone and pottery that when collected and scientifically studied give us our sole glimpse into the days when that whole area was teeming with life. To find, explore, and attempt to explain these remaining evidences of prehistoric activities should be undertaken by the Smithsonian Institution in cooperation with the National Park Service.

The methods to be adopted in making these explorations depend a great deal upon the number of natural difficulties to be overcome. The rugged and semiarid character of the country handicaps exploration and restricts it to those seasons of the year when water and forage are most apt to be found. Climatic conditions must also be anticipated for the best results, and early spring or fall of the year are the best periods for this work. Working parties must necessarily be small, and the most satisfactory results are to be obtained, it is believed, by one or two trained scientists, assisted by the necessary guides with their equipment. This enables explorations and charting to be done at a minimum of expense, it being estimated that the annual appropriation needed for such work would not need to be much more than $1,000. Furthermore, it is believed that the region north of the Grand Canyon could be completely explored by persistent effort during favorable seasons in about three years. This covers only reconnaissance work and, of course, not desirable restoration or excavation. It is important that the work

should be undertaken as quickly as possible, for aside from the scientific value of new discoveries, they advance the purposes of our national-park work by adding features to arouse the public interest and by enlarging the common understanding of historic and prehistoric facts.

These investigations will be published shortly by the National Museum. There are also some interesting prehistoric buildings and other works of ancient peoples on the south rim of the gorge that will be made accessible to the public.

W. W. Wylie, who was formerly connected with a camping enterprise in Yellowstone National Park and who has operated a camp in Zion National Monument, Utah, for several years, was granted for the season the privilege of maintaining a camp at Bright Angel Point on the north rim. He reports a considerable patronage of his facilities.

GRAZING IN THE PARK.

When we assumed charge of the park, the Forest Service policy with respect to the grazing of cattle on park lands was continued for the year 1919 in order that no injustice might be done to permittees. If, upon investigation, it is found that the park is overgrazed, or that the cattle are interfering with the use of the area by tourists, adjustments of these privileges will be necessary.

A WINTER AND SUMMER PARK.

Heretofore Hot Springs Park in Arkansas has been practically the only winter resort of the national park system. However, the Grand Canyon now gives us an opportunity to expand our appeal to the winter traveler, and with the contemplated facilities for entertaining tourists in Yosemite Park in winter our field will be broad enough and sufficiently varied in its attractions to profoundly influence the winter resort business of the Nation.

The travel to the park since it has been taken over by this service has exceeded all previous records except that of 1915, the Exposition year, and all indications point to the greatest winter travel of its history. The new park has a glorious destiny.

LAFAYETTE NATIONAL PARK.

February 26, 1919, looms large in national park history. That date established the Lafayette National Park in the State of Maine, the first national park east of the Mississippi and I predict the ancestor of others that will enter our splendid family in the coming years. From July 8, 1916, to February 26, 1919, it was administered as the Sieur de Monts National Monument. Its establishment had origin in the keen desire of two men—President Emeritus Charles W. Eliot, of Harvard, and George B. Dorr, of Boston, both for many years visitors in that country and ardent lovers of its scenic qualities and historic atmosphere—to save this fine area of 5,000 acres upon Mount Desert Island as a national park for the benefit and enjoyment of the people. As you know, excellent cooperation also was given them by others in this invaluable undertaking. They formed an incorporated association for the stated

object of raising, holding, and appropriating for public use such lands in Hancock County, Me., which by reason of historic interest, scenic beauty, or other causes were suited for their purposes of incorporation.

FIRST NATIONAL PARK IN THE EAST.

But it was not until 1908, five years after the Maine Legislature passed the act of incorporation, that the first gift of land was received by this public-spirited body. Other tracts were later added. The reservation grew. In the spring of 1913 it had assumed such proportions that the association felt justified in offering the areas acquired to the Government. The plans matured, and in the spring of 1914 the matter was laid before you for your sanction. You warmly encouraged them to proceed with their work. Two more years were spent on the consolidation of the tract and the removal of imperfections in title by purchase, suits in equity, and other means until finally, May 3, 1916, the tract was offered to you for a national monument. You accepted, and the proclamation was drawn up accordingly. On July 8, 1916, it became a national monument. The bill to create it a national park was passed unanimously by both House and Senate and approved by the President on February 26, 1919, and the first step taken in the development of national parks in the east received the heartiest and warmest acclamation.

ITS VARIED NATURAL ATTRACTIONS.

A refreshing feature of Lafayette National Park is that it is located right on the ocean front and, therefore, the first in this country actually bordering on the sea. The mountainous heights jutting boldly into the ocean are the only monadnocks on the Atlantic seaboard. Upon the cool refreshing waters lapping their base, and dotted here and there with islands, is the opportunity for developing a recreation facility for the tired man and woman of our eastern cities absolutely unique in our national-park aspirations, namely house-boating. Mr. Dorr, the superintendent, has in mind an extensive house-boating system of a simple, inexpensive sort. Camping opportunities are encountered on the broad expanse of the uplands, and along the shores there is place for the establishment of hotels to provide appointments of a higher quality for those who desire them. Bathing, fishing, and canoeing will be other tempting incidents of a visit to this park.

The park, as any other national park, is sanctuary for its wild life. A splendid chance is afforded to restore the natural life under our national-park protection to its former regions and native haunts—affording particularly conspicuous instance of wild-life conservation. Beaver formerly abounded in great numbers, but now are practically extinct; during the year several young beavers were presented to the park and others will be added. Eagles nest in the tops of the trees. Moose have been seen. Deer roam freely through the uplands. Curiously enough, the greatest difficulty in the protection of this wild life comes, not from human beings, but from dogs, who hunt generally in pairs. The park is a natural haunt and nesting

ground of the ruffed grouse, New England's most valuable game bird. Wild ducks and geese are encountered in the sheltered spots along the shore. The park lies directly on the northward bird migration route, and it will soon abound with the life of our feathered protégés. Mr. Henry Lane Eno, ornithologist of Princeton University, has been placed in charge of the wild-bird life of the park, and you have also appointed Mr. Edward L. Rand, of Boston, secretary of the New England Botanical Society, as botanist. For its natural history study Mr. Charles W. Johnson, curator of the Boston Natural History Museum and an entomologist of note, is studying the varied insect life of the park. These men serve for a nominal compensation. The results of their efforts will be available in concrete form when they have completed their studies and add their generous share to the understanding of the attractions of our first eastern park.

It is interesting to know that, as in our western parks, great care also has to be taken in guarding against forest fires. In the spring the dry leaves on the ground and the dead marsh grasses are ready material for the spread of a fire. A small blaze must be quickly killed or it spreads with rapidity over a large area. Cleaning up dead timber to reduce this hazard to a minimum is one of the tasks of the rangers. Forestry work is urgently needed in the woodland portions of the park. The tracts of primeval forest should be cleared from underbrush. These forests are its richest heritage, forming the only exhibit in our system of the Appalachian forest with its evergreen and deciduous trees and their magnificent autumnal colorings.

PROPOSED DEVELOPMENT.

Now that the war is ended Lafayette Park can enter fully on its destiny and it is my purpose for the next fiscal year to submit to you an estimate for its larger development. The appropriation of $10,000, available for the maintenance and protection of the park area, is devoted to the guardianship of its wild life—bird, animal, and plant—to the maintenance of old trails and the development of new ones, and to carrying on minor improvements and surveying for future development. In the administration of the park, the superintendent has one office assistant and three park rangers who do very effective work.

During the coming year ranger camps will have to be established at various points of the park to make for a more effective protection of wild life, for discovery of forest fires, and the instruction and guidance of visitors. Additional well-built footpaths are needed to lead the wanderer through many delightful vistas to striking vantage points.

ADVANTAGES OF ITS LOCATION.

The park, situated close to Bar Harbor, is favorably located for tourist travel, and the tourists include many persons prominent in affairs. The natural attractions, its unusual topography, and particularly the salubrious climate will tempt as large a number of visitors as western parks enjoy, but this travel will have to be measured according to the development of the potentialities of the

entire tract. Sixty-four thousand visitors traveled to the park during the season.

HAWAII NATIONAL PARK.

Although no funds for the administration of this park have been available, the small appropriation made by Congress for purposes of inspection and the continuance of negotiations toward the acquisition of the private lands situated within the proposed park was effectively used during the months of April and May, when I visited the Hawaiian Islands for the purpose of making a preliminary study of the park's needs and particularly its private land problem. Accompanied by Landscape Engineer Punchard, I sailed from San Francisco April 8, on the S. S. *Manoa*, of the Matson Navigation Line, and arrived in Honolulu April 14, 1919.

After a day or two in Honolulu devoted to the final arrangements for the trip to the reservations and consultations with the trustees of the Bishop estate in regard to the exchange of lands, our party, consisting of Mr. Lorin A. Thurston, representing Governor McCarthy who was unable to accompany us on account of pending legislation, Mr. Bailey, land commissioner of the Territory, Mr. George Collins, engineer for the Bishop estate, Mr. C. S. Judd, Territorial forester, Brig. Gen. George Hodges, commanding the Hawaiian Department, Mr. L. W. de vis-Norton, Mr. Punchard, and myself, embarked on the S. S. *Manua Kea* for the island of Hawaii and the volcano of Kilauea.

THRILLING LAVA SPECTACLES AT KILAUEA.

Several days were spent at the Volcano House from which we made trail trips up the slope of Mauna Loa and to the south along Crocketts Trail and the crater of Makaopuhi and into the country surrounding the crater of Kilauea.

The volcano of Kilauea is the chief attraction of this section of the reservation, but the tree fern forests, the forests of Koa or Hawaiian mahogany, and the Ohia trees are of no less interest, totogether with the remarkable lava formations, tubes, blow holes, steam vents, sulphur beds, lava flows, and wild flowers.

For some time the pit of the crater of the volcano had been in a quiescent state. The level of the lake of lava had risen and fallen in a quiet and not unusual manner, until only a few days prior to our visit it assumed an uglier mood and rapidly rose in its pit with a pressure so great that the sides and surroundings of the pit were rapidly distorted, and the single lake of lava, which had existed up to that time, was broken into four distinct lakes, with walls of lava 30 and 40 feet high separating them. We were told that it had been a gradual climb from the terminus of the automobile road to the edge of the pit, but that the pit had been surrounded on that side with a wall of tumbled lava rock 30 or 40 feet high. On one side a great cone 20 feet high stands alone about 50 feet from the edge of the pit, and from its top gas hisses and burns with a blue flame. Occasionally, when the level of the lava in the lake is at a certain height, red-hot molten rock is forced out of the opening in the top of this cone, down the sides of which it flows and away across the floor of the crater. On the evening of our arrival, as we stood on the porch of Volcano House,

we saw lava flowing from this cone in a great cascade 3 miles away across the crater, and after dinner, when we drove over to the crater, we walked across the crust of this new flow, only an inch or two thick, and through the cracks in which and on the edges of which we could see the red-hot lava flowing beneath our feet. The heat was so great that we could not stand long in one place. Later, on our return, as we left the pit and walked toward the automobiles, we were escorted by Prof. T. A. Jagger, the official in charge of volcanological investigations and measurements under the direction of the United States Weather Bureau, directly beneath this cone which so short a time before had been throwing out tons and tons of red-hot lava.

PERRITT'S CONE AND THE CROCKETT TRAIL.

Another afternoon we walked across the crater from the Volcano House to the toe of the flow, which had reached almost to Perritt's Cone, nearly a mile and a half from the pit. This distance had been covered in a day and a half. From Perritts Cone we walked along and across this flow until we reached the edge of the North Lake, so called. As we approached it we found it overflowing its shore line and coming directly toward us. The lake was in a state of great agitation. The surface was continually moving back and forth in great waves and a rapid succession of lava fountains were continually breaking forth. These took the form of red-hot lava, being thrown into the air for a distance of 30 feet. The greatest number were near the edge which we approached, and as they took place the lava was thrown out of the lake onto the shore, thus forming the flow.

A trip over the rough, broken, tumbled lava surrounding the lake gave us an opportunity to inspect all sides of this new formation, but as we approached the windward side of the pit it was necessary to resort to handkerchiefs over our noses and mouths in order not to be overcome by sulphur fumes, great clouds of which were being continually blown off.

All lands on this side of the crater belong to the Government, but are wholly unfit for development as camp or hotel sites on account of the noxious fumes. The lands not affected by these fumes are largely held in private ownership and are the areas that we are seeking to obtain for park purposes.

The trip over Crocketts Trail traversed a country of fern forests, Ohia forests, and extinct craters varying from several hundred feet in diameter and 500 to 600 feet deep to craters over 1,000 feet in diameter and 1,200 and 1,500 feet deep; craters so long extinct that nature has succeeded in clothing their sides with growing trees 100 feet high and 2 feet in diameter. In contrast to the activity of Kilauea, these stand as an object of interest in nature's endeavors to reclaim the desolation she makes in the formation of the earth by volcanic action.

MAUNA LOA PARK AREA.

I did not attempt the climb to the summit of Mauna Loa, as this trip required two days of very strenuous riding and walking. All private holdings in the Mauna Loa Park area have already been acquired. The next step to be taken in planning the development of this park area is the survey of a road to connect the Kilauea area

with the summit of Mauna Loa, authority for which is contained in the organic act establishing the park. This work will be undertaken by our engineers at the first opportunity.

THE HALEAKALA PARK AREA ON MAUI.

Our visit to Haleakala, on the summit of which is one of the largest extinct craters in the world, was well worth the long, tedious climb by horseback over a rough trail. After spending the night in a comfortable concrete rest house constructed by the Maui Chamber of Commerce, we arose early to view one of the most wonderful sunrise effects imaginable. Ten thousand feet above the ocean, which we could see far below, we waited, and soon were rewarded by a faint glow; then, as the sun rose higher above the horizon, the glow gradually changed to a beautiful orange red, and the clouds like great white downy rivers flowed and disappeared into the crater on the edge of which we stood. As the sun rose higher the colors in the crater became more and more intense, the shadows deeper and bluer, and then the sunlight began to brighten the sugar-cane fields far below fully 10 or 15 minutes after we had first seen the glow. We watched for almost an hour, and then reluctantly went in to breakfast. It seemed like two worlds, one above the other, one alive and the other coming into life as the sun warmed it.

From Maui we returned direct to Honolulu, and on the morning of May 7, 1919, we sailed for the California coast on the steamship *Korea Maru*, of the Toyo Kisen Kaisha Line, arriving in San Francisco at noon on May 13.

Particular mention should be made of the courtesies extended to myself and party during this trip. Everywhere we were shown every attention, and great interest was taken in the object of my visit. In many cases business men interested in the project took time from their work in order to help us in gathering the information we sought.

EXCHANGE BILLS PENDING IN CONGRESS.

Before any appropriation for the improvement of the Hawaii National Park can be made private holdings necessary in the administration and operation of the park must be secured, together with rights of way for roads and trails. An inhibition in the organic act establishes this situation. Such holdings can not be acquired in the Kilauea section without prior enactment of legislation authorizing certain exchanges of lands belonging to the Territory for the private lands of the area prior to the proper development of the park. These lands are owned by the Bishop estate, the officers of which have agreed to make the necessary exchange on a reasonable basis. The terms of this exchange were considered in detail in my extended conferences with the officers of the estate in Honolulu, and we can proceed to carry them out as soon as Congress authorizes their execution.

On pages 1044 to 1046 I have outlined the history of the pending legislation. S. 5323 of the Sixty-fifth Congress passed the Senate on February 25, 1919, but did not receive the attention of the House. Early in the present session, however, Delegate Kalanianaole, of Hawaii, introduced H. R. 3654, which is essentially the same as the

measures introduced in the previous session. This measure was reported favorably to the House by the Committee on the Territories on July 21.[1]

In the recently enacted sundry civil bill Congress appropriated an additional $750 for the continuation of negotiations looking toward the elimination of the private holdings of the park.

With the clearing up of the details relating to the exchanges of land in these reservations, money should be appropriated for maintenance, protection, and administration. A superintendent should be appointed and a ranger or two for protection and guidance to tourists. Automobile camps should be laid out and developed, sites for which were selected at the time of my visit, signs should be made and posted for the guidance of the tourists on trails and roads, and other such undertakings, the nature of which is in keeping with the administrative policies of the park service, should be carried out.

LASSEN VOLCANIC NATIONAL PARK.

Another park created by Congress with the evident intention of development as an important national playground is Lassen Volcanic Park in California, and yet no funds have ever been provided to make possible the assumption of control of the area by the National Park Service. It is still administered by the Department of Agriculture as part of the Lassen National Forest.

A certain amount of grazing in the park area has been permitted in accordance with the policies of the National Park Service with respect to the pasturage of cattle. The control of this grazing has been entirely in the hands of the forest rangers.

NO FUNDS FOR PROTECTION OR IMPROVEMENT.

So far as I have been advised, no road or trail improvement has been accomplished in the park during the past year. Naturally we have not been in a position to carry out any plans for its administration, protection, or improvement. Considerable interest is being taken by the citizens of northern California in the ultimate development of the reservation, but I am interested chiefly in securing sufficient funds to establish a protective office in the park and maintain existing improvements until such time as Congress is ready to make substantial appropriations for the extension of roads, trails, and other means of reaching the many interesting points that are now more or less remote and inaccessible.

Upon the other hand, if it is now the intention of Congress not to consider this park as a part of the system it ought to be withdrawn and made a national monument.

INTERPARK ROUTE VIA LASSEN VOLCANIC PARK.

In connection with the designation of the park-to-park highway and its alternative routes, it has been suggested that a most fascinating tour might be made from Crater Lake National Park to Yosemite National Park by way of Klamath Falls, the famous lava beds,

[1] See the committee report on p. 1240.

Lassen Volcanic National Park, and Lake Tahoe. I have traveled over a large portion of this route, and I know that it would make one of the most unique and interesting tours that an interpark traveler could take. It is to be hoped that in the further improvement of the highways of California under its recent bond issue special attention will be given to the problem of repairing or rebuilding the various sections of road that would make this trip feasible.

VOLCANO QUIET.

During 1918 Lassen Peak has been quiescent, although eruptions were quite frequent in 1917, especially in May and June. The latest eruption of black smoke, indicating the presence of ejected ashes, reported by observers in the vicinity of Lassen Peak, occurred December 3, 1917.

MOUNT McKINLEY NATIONAL PARK.

Although this park was established on February 26, 1917, as an emergency step in the preservation of the great herds of wild animals of that region, which were in danger of extermination through the operation of market hunters, Congress has not yet provided any funds for carrying out the provisions of the organic act. Estimates for appropriations in the amount of $10,000 for the fiscal year ending June 30, 1918, were submitted a few days after the enactment of the bill creating the park, and the annual estimates for the fiscal years 1919 and 1920 also contained this item. It is again being submitted in the budget for the fiscal year 1921.

While it is true that curtailment of work on the Alaska Railroad during the war reduced somewhat the danger that threatened the animal life of the park, nevertheless some measures to protect the reservation should have been taken. It was and is quite impossible for the territorial government to undertake the care of the park under the small appropriation that is made for game protection throughout the immense area of Alaska.

It will not be the policy of the National Park Service to immediately open this park to tourists; in fact, several years may elapse before any program for developing the scenic and recreational features of the park is adopted. We are interested now only in the preservation of the caribou, mountain sheep, and other animals that make this region their home. The park as a game preserve is almost comparable with Yellowstone National Park, and it is in much more danger from the hunter, because it is far distant from civilization and is little known.

CIVILIZATION BRINGS DANGER TO PARK ANIMALS.

Work on the Alaska Railroad is being pushed with renewed energy now. Soon the railroad will reach the neighborhood of the park, bringing with it construction camps and then towns, with a considerable population. Thus the menace to the unprotected park ever grows. Unless we are provided with funds to undertake the preservation of its wild life the principal purpose of Congress in creating the park will be completely defeated and another blot will have been spread upon America's unenviable record in the conservation of its wild life.

WIND CAVE NATIONAL PARK.

A remarkable increase in travel was the outstanding feature of the operation of Wind Cave National Park during the past year. Situated on one of the principal trans-State highways and not far distant from popular transcontinental highways, Wind Cave Park has tapped an unusually large volume of tourists, most of whom, of course, were motorists who were traveling in the West in their own cars.

Many of these visitors have taken advantage of the improved transportation facilities to visit not only the cave but also the headquarters of the game preserve for the purpose of seeing the animals. No provision has yet been made for the convenience of such visitors, many of whom would doubtless like to spend a few hours enjoying the beauties of the northern part of the park along Cold Brook and Beaver Creeks. Provision should be made for suitable picnic grounds and for the convenience of persons who wish to visit this part of the park, as well as of those who take the trip through the cave.

NO IMPORTANT IMPROVEMENTS MADE.

There have been insufficient funds available to make any extensive improvements of the park, but it has been well maintained under most careful expenditures of funds by the superintendent in charge. There are many things that ought to be done for this park, however, and I believe that Congress should progressively increase the appropriations for it each year until its essential needs are completely met.

SON SUCCEEDS FATHER.

Mr. Thomas W. Brazell, who was appointed superintendent of the park on August 20, 1914, resigned on March 15, 1919, and his son, Roy, who served in the park as a ranger for several years prior to the war and who had just returned from service in the Army, was appointed to the vacancy.

The superintendent's report, which will be found in Appendix B, gives many interesting facts regarding Wind Cave which have not been published in the reports of previous years. A perusal of this report will be both entertaining and enlightening.

GAME PRESERVE PROSPERS.

The game preserve maintained in the northwestern part of the park under the supervision of the Biological Survey, includes 4,160 acres under fence. This preserve, established in 1912, now contains more than 160 head of big game, including 52 buffalo, 85 elk, and 27 antelope. The total includes 12 buffalo calves and 7 young antelope, born during the present season, but does not include the elk calves, the number of which has not yet been reported.

The buffalo herd has become thoroughly acclimated, very few losses having occurred since its establishment, and during the past year the increase has been about 25 per cent. The elk, most of which were transferred from the Yellowstone National Park, have also done remarkably well, the 46 head originally placed having nearly doubled in number. The antelope have been less successful, and con-

siderable difficulty was experienced at first on account of depredations of coyotes and other predatory animals. Fortunately, these losses have now been checked. During the past season 13 coyotes and 7 bobcats have been killed in or near the preserve and losses from these sources have practically ceased. The birth of 7 young antelope this season indicates that the herd has become fully acclimated and now gives promise of fairly rapid increase.

CONSERVING THE WATER SUPPLY.

The unusual dry season during the spring and early summer of 1919 has emphasized the necessity of conserving the water supply. The water supply in the park, always scanty, has been put to a severe test by the drought, but the permanent springs and the upper part of Cold Brook Creek have furnished water even during the driest part of the season this year and may be relied on for a regular supply. Future improvements of the park, however, may require not only the development of the present water supply, but the acquisition of several other springs in order to furnish adequate supply for headquarters, for the game preserve, and for the use of visitors.

PLATT NATIONAL PARK.

Lack of funds made it impossible for the National Park Service to do anything more in Platt National Park than maintain existing improvements, and, due to the increased cost of labor and materials it has hardly been able to keep the park from going backward. The appropriation for its administration, maintenance, and protection should be increased eventually to at least the amount of funds that was made available annually prior to the war.

Among the essential improvements that should be made may be noted the sinking of wells at Antelope and Buffalo Springs, which suddenly became dry in January, 1918, and have not yet resumed their flow. In all likelihood these springs have become permanently inactive.

GAME PRESERVE DEVELOPMENT.

Public-spirited citizens of Oklahoma, particularly of the town of Sulphur, which is situated near Platt National Park, have offered to subscribe funds for the importation of several elk and buffalo for this park, and I have accepted their generous tender of cooperation in this enterprise. The elk will be shipped from Yellowstone National Park during the coming winter and the buffalo will be obtained from the Niobrara Reserve. There are a few white-tail deer in the park, and numerous smaller mammals and birds are quite plentiful. It appears, therefore, that this park has possibilities as a game preserve that are certainly worth developing.

THE CLIFFSIDE TRAIL.

The scenic walk in the hills of the park, known as the Cliffside Trail, is in bad condition and ought to be repaired. However, we have not sufficient funds available to do this work. Likewise it is impossible for us to perform a number of other rather necessary improvements that would give much more enjoyment to the people who use the park.

Col. Richard A. Sneed, who became superintendent on February 14, 1914, resigned on June 30, 1919, to become commissioner of Confederate pensions of the State of Oklahoma. He was succeeded on July 16, 1919, by Mr. Thomas Ferris, who was formerly superintendent of the Blackfeet Indian Reservation and just prior to entering this service was superintendent of the Pawnee Indian School.

SULLYS HILL NATIONAL PARK.

The development of Sullys Hill National Park as an important game preserve received great impetus when an appropriation of $5,000 was made by Congress for general improvement. The clause from the appropriation act making these funds available follows:

"For the improvement of the game preserves in Sullys Hill National Park, in the State of North Dakota, including the construction of all fences, sheds, buildings, corrals, roads, shelters, and other structures which may be necessary for the protection of game or for the use of visitors, in addition to the amount heretofore appropriated, $5,000, the same to be available until expended."

This preserve has been maintained by the Biological Survey since 1915. It is now stocked with 6 deer obtained from the Agricultural Experiment Station at Fargo, 7 buffalo procured from the park department of Portland, Oreg., and 22 elk from Yellowstone Park. This constitutes a representative collection of the big game of that territory and affords a large community an opportunity of seeing these animals under natural conditions.

Under the above-mentioned appropriation buildings will be constructed for both visitors and animals, an adequate water supply will be established, sanitary arrangements perfected, and perhaps bathhouses constructed on the shore of Devils Lake. Pavilions for the shelter of visitors have already been built. The proposed Sunset Highway projected along Devils Lake, at the north side of the park and running directly through the entire area, will undoubtedly stimulate travel to this attractive park.

HOT SPRINGS RESERVATION.

In my last report I gave in some detail our plans for a broad development of Hot Springs Reservation, including a description of what appearance the improved front would have when the most important features of the building program and landscape work were completed. I mentioned, too, the fact that Congress had appropriated $140,000 from the Treasury and $50,000 from the park revenue fund for the construction of a new administration building and Government free bathhouse on the site of the present administrative headquarters at the corner of Central and Reserve Avenues. This building was to be the first unit of the comprehensive development.

Shortage of labor and high cost of materials would have prevented the construction of this building during the last fiscal year even had I been entirely satisfied that the location of the proposed new structure was the best that could be found. However, I was not sure that the location was right, and upon my visit to the park in November, 1918, I gave a great deal of attention to the problem of relocating it. I finally concluded that two buildings should be erected, one for ad-

ministrative purposes on the present office site, and the other a free bathhouse to be built on some other site which would be not far distant from the hot-water supply, and yet accessible directly from the part of the city in which most of the indigent people who would use the free baths would ordinarily dwell while there for treatment. A site on the reservation that would meet those general requirements could not be located. The sites suggested were either located near the reservation front or on the hillsides distant from the quarters of the bathhouse patrons and more or less inaccessible to them, or on the side of the park area near these quarters and yet so far from the water supply that an expensive pumping plant would be required to supply the bathhouse with hot water.

HOT SPRINGS CITIZENS GIVE BATHHOUSE SITE.

At length it was discovered that block 82 in the city of Hot Springs across Reserve Avenue from the Reservation and nearly opposite the eastern end of the Army and Navy Hospital area would meet our requirements very satisfactorily. This the citizens of Hot Springs agreed to buy and present to the Government. The title of the land, however, was found to be in an estate which was being administered by the Alien Property Custodian. The acquisition of the property under the rules and regulations of that office is in progress now, and title to the block will soon be transferred to the United States.

Under the following provision of the sundry civil act of July 19, 1919, the funds made available last year were reappropriated for the current fiscal year, two buildings were authorized, and authority to accept the gift of the city property was granted to the department:

> The unexpended balance of the appropriation and authorization contained in the sundry civil appropriation act for the fiscal year 1919 for the construction of a new administration and Government free bathhouse building is reappropriated and made available for the fiscal year 1920. The Secretary of the Interior is authorized, in his discretion, to use such appropriation and authorization in the construction of separate buildings for administration and free bathhouse purposes and to accept sites in the city of Hot Springs which may be donated for said buildings.

The presentation of block 82 to the Government will enable us to carry out the plans of establishing the free bathhouse in that location with much larger facilities than we could have provided on the location chosen last year for the combined bathhouse and administrative building.

BATHHOUSE PLANS APPROVED.

Preliminary plans for the new free bathhouse have been submitted by the firm of Mann & Stern, and have been approved by you and by the Commission of Fine Arts, and it is hoped that before the end of the next season the new building will be completed and ready for use. This will make possible the removal of the old free bathhouse which is now in a dilapidated and rather unsightly condition in addition to being woefully inadequate to meet the demands for baths.

Instead of building a new administration building the present structure will be utilized as far as possible, it being our intention to

so remodel this building as to make it harmonize fully with the new bathhouses on the reservation front, or Bathhouse Row, as it is popularly called. This means that a new front, at least, will have to be placed on the present administration building.

IMPROVEMENT OF RESERVATION FRONT.

Three new bathhouses will also be erected on the reservation front. One will occupy part of the sites of the former Horseshoe Bathhouse and the present Magnesia Bathhouse, and the central portion of this new structure will occupy what is now a wide walk to the old free bathhouse, which is located on the hill to the rear. This will be known as the Platt Bathhouse and will be built by Mr. Dan F. Platt, who leases the Magnesia Bathhouse and who also leased the Horseshoe before its demolition a few years ago. On each side of this new structure and between it and the Fordyce Bathhouse on the north and between it and the Ozark Bathhouse on the south it is proposed to erect two comfort stations, which will form a part of the broad development of the park by the Government. It is hoped that these comfort stations can be built next year while construction of other buildings on the park front is in progress.

Another new building will replace the present Ozark Bathhouse and will be built on the same site by the lessees of the existing enterprise. Likewise, between the new Buckstaff Bathhouse, south of the Ozark site, and the Reservation office, a new building will be constructed to take the place of the Lamar Bathhouse. It will be built and operated by the lessees of the present Lamar establishment.

It had been our plan to order the demolition of the Magnesia, Ozark, and Lamar Bathhouses at the end of the season that closed in the early spring of this year, but circumstances conspired to make this course inadvisable. An extension of time in which to undertake this work was granted, with the definite mutual understanding that these old frame buildings were to be removed as soon as the coming season ends. In other words, the lessees were permitted to operate their present plants for one more season. It was very difficult for these lessees during or immediately after the war to secure necessary funds to rebuild, but we have received every assurance that necessary financial arrangements are being made and that the new bathhouses will be constructed next year. This means that within approximately a year from this date our lessees will have completed their part in the improvement of the reservation front in harmony with the general plan of development.

AN IMPORTANT HOUSING PROBLEM.

I am still giving much thought to the problem of caring for indigent people who come to Hot Springs to use the facilities of the free bathhouse, and while a completely feasible plan has not yet suggested itself, I expect to develop soon some satisfactory program for meeting this problem. In working on this important matter I am taking every opportunity to interest social-service and related organizations who have had experience in solving similar problems.

The citizens of the city of Hot Springs have already rendered a national service in relieving the suffering of scores of poor people

who have visited the park for treatment, and they are still engaging in the work to the extent of their ability, but the need is growing each year and has far passed the capacity of the Hot Springs people to adequately render aid. Furthermore, the call of humanity is not one that the Hot Springs people should answer alone. The Nation should respond, and its contribution should take the form of carrying out some comprehensive housing plan which, of course, it is our duty to develop, in cooperation with any agencies that are qualified to render advice and assistance.

SPECIAL LANDSCAPE IMPROVEMENT.

In order to improve the landscape effects of certain sections of the park, prior to the opening of the tourist season, I ordered, on the occasion of my inspection visit, approximately 15,000 bulbs of tulips, red, white, and blue hyacinths, and narcissus, which were planted during the month of December, under the supervision of Mr. Jens Jensen, the Chicago landscape architect, who made a trip to Hot Springs at my request. The beautiful effects of this planting surpassed all expectations and were much appreciated by the winter visitors.

Mr. Jensen, during his visit, gave some very interesting suggestions to the municipal authorities for development of approaches to the Reservation from the railroad terminals, and for other city improvements.

CHANGE OF NAME DISAPPROVED.

An effort was made during the consideration of the last sundry civil bill to change the name of this park area from Hot Springs Reservation to Hot Springs National Park, but it was unsuccessful. There is no reason why this change should not be made, and at the first opportunity another effort will be made to present the merits of the proposal to Congress.

HOT SPRINGS SEASON.

Hot Springs is continuing to grow in popular favor with great rapidity. The past season was the best in the history of the reservation, over 150,000 people having visited it in the course of the year.

The number of paid baths was 729,997, while the corresponding figure for 1918 was 704,975. The gain of the past season was 25,022. The total receipts for 1919 were $346,974.46, as against $332,791.12 last year, a net gain of $14,183.34. On the other hand, the net profits decreased somewhat, due to the greatly increased cost of operation. The 1919 season profits were $127,475.64, while the profits of last year were $127,911.74.

Baths to the number of 87,040 were given to indigents at the Government free bathhouse. The total number of baths given during the year, including the paid baths, complimentary baths at pay bathhouses, and 5,445 at the Leo N. Levi Memorial Hospital bathhouse, a charitable institution, was 824,326, an increase of 21,501 over last year.

ZION NATIONAL MONUMENT, UTAH.

Zion National Monument is about to become a national park.[1] S. 425, introduced by Senator Smoot on May 20, 1919, was passed by the Senate on June 20 and is now pending in the House of Representatives. There appears to be no opposition to the measure and we may reasonably expect it to be enacted into law very soon.[2]

On account of the reduction in the appropriation for the national monuments, very little money has been available for the improvement of Zion Monument during the past season. A small sum was allotted for the improvement of the automobile road, and some work on the trail to the rim of Zion Canyon may be undertaken. As soon as this great scenic monument is made a park certain extensive improvements should be made immediately. Among these is the construction of a first-class trail from the floor of Zion Canyon to the west rim—a trail that can be used by pedestrians and horses. Such a trail ought to compare favorably with the ledge trails of Yosemite Valley. The automobile highway should be extended to the Narrows and should be protected in several places from the ravages of spring torrents. Other trails should be built about the floor of the valley, and as many side trips as possible made available for visiting tourists.

TRAVEL AND ACCOMMODATIONS.

During the year Mr. W. W. Wylie maintained the camp at Zion Canyon which he established early in the season of 1917. He is maintaining this camp enterprise with difficulty on account of the fact that visitors are not disposed to stay in the monument because there are so few side trips to make. However, when the improvements referred to have been brought about it is anticipated that there will be so much of genuine novelty and extraordinary interest for the visitor to enjoy that he will spend a week, or even weeks, there.

An attractive publication on Zion National Monument which was issued by the Bureau of Service, National Parks and Monuments, of the Railroad Administration, has undoubtedly been responsible for increasing travel to the monument this year, but, strange to say, it has been the means of inducing more motorists to make the trip than people who were utilizing train service to tour the country.

STATE ROADS IMPROVED.

The State of Utah has continued its work of improving the highways leading to the monument, most of its work consisting of the construction of permanent betterments. There is some talk of opening the Arrowhead Trail from Salt Lake City to St. George, and if this work is carried out travel to Zion National Monument will increase by leaps and bounds.

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[1] On October 6, 1919, S. 425 was passed by the House of Representatives with several minor amendments. The bill is now in conference and it is not anticipated that any delay will be encountered in reaching an agreement on same. It is reasonable to expect, therefore, that an additional national park will be added to the present system in the very near future.

[2] See committee report in Appendix D, p. 1215.

A NATIONAL TREASURE.

This reservation is worthy of the best consideration of the Federal Government. It is national park material of the first order. There is to be found so much of genuine novelty and quite extraordinary beauty that I predict its fame will draw quickly a large number of enthusiastic visitors. The main canyon is one of the most beautiful, as well as one of the most unique gorges in the world; in spots it is strongly reminiscent of the Yosemite Valley,

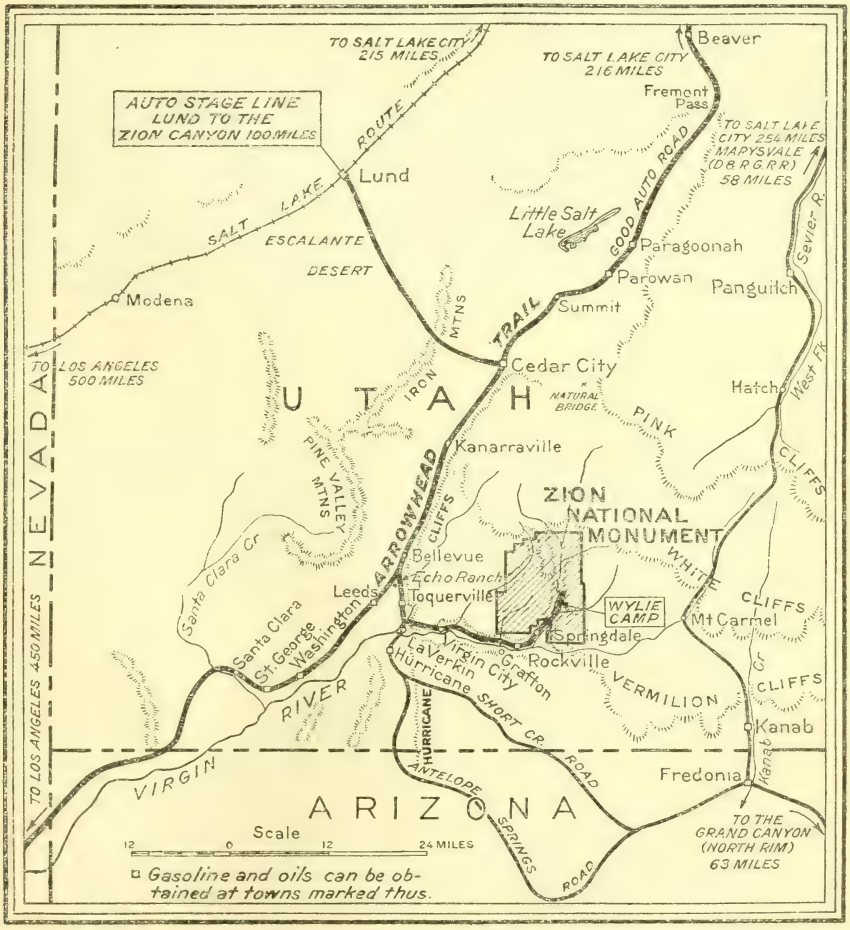


FIG. 2.—Map showing location of Zion National Monument in southern Utah, with principal connecting roads.

but it is so different that there is no resemblance. It has been called the "desert Yosemite," but this is a misnomer, for it blooms like a rose. There is no desert suggestion except in some of the vegetation, which distinction is perceived by only the most practiced eye. Fine prehistoric dwellings have been discovered during the past summer, located only 4 or 5 miles from the entrance. The main need of the development of this region is roads, and once supplied with

a good road system leading to the park's entrance, and developed within its borders, travel will grow rapidly.

MUIR WOODS NATIONAL MONUMENT, CALIFORNIA.

This monument was established in 1908, after it had been donated to the Federal Government by William Kent, of California, and each succeeding year it has been visited by many thousands of people.

STEEP RAVINE GIFT TO NATION.

Mr. Kent is now arranging to convey to the Government another tract of beautiful forest land for the purpose of enlarging this monument. This tract will include Steep Ravine, a particularly beautiful wooded gorge not far distant from the Pacific Ocean.

AUTOMOBILES MAY BE EXCLUDED.

A question has arisen as to whether or not automobiles ought not to be excluded from Muir Woods. I am inclined to take the view that automobiles ought to be parked south of the monument and that the present road in the woods ought to be maintained hereafter as a foot and bridle path. In the event that it is decided to exclude automobiles, it will be necessary to construct an adequate parking space immediately below the reservation. The owner of these lands has tendered to us the privilege of utilizing them as a parking area.

With machines excluded the monument will offer far more advantages as a camping and picnic ground, and visitors will undoubtedly gain more pleasure from their contemplation of the beauty and majesty of the immense Sequoia trees, as the short walk from the proposed parking area will not be a hardship to the motorist.

A WATER SYSTEM INSTALLED.

During the year 5,040 feet of water pipe were installed in the Muir Woods, together with 10 hydrants, thus making good water conveniently available for drinking purposes. A small dam was installed in a remote ravine beyond the boundaries of the monument, thus providing a reservoir protected from any ordinary means of pollution. The right to use this water was conveyed to the Government by Mr. Kent. Better toilet facilities will also be provided this season.

Many other improvements, however, are required, including the rebuilding of most of the trails of the monument and the construction of new trails, both for the use of visitors and to serve as fire-patrol routes.

A cottage for the custodian must also be built in the early future.

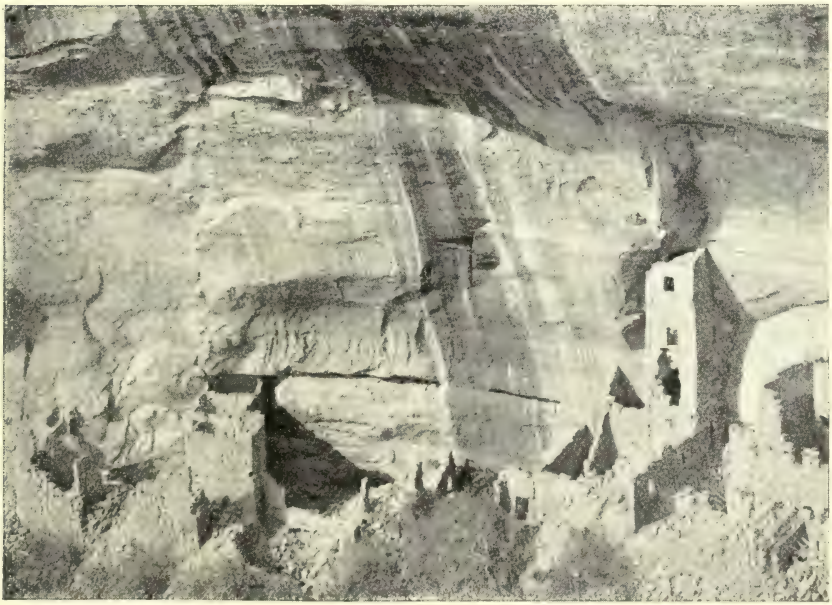
CASA GRANDE NATIONAL MONUMENT, ARIZONA.

Under direction of Custodian Frank Pinkley a very considerable amount of important yet inexpensive improvement work was accomplished in the Casa Grande National Monument during the past year. The work was largely confined to clearing débris from the reservation, and particularly the recent growth of brush that has sprung up dur-

Photograph by Hawaiian Volcano Observatory.

KILAUEA'S "LAKE OF EVERLASTING FIRE."

HAWAII NATIONAL PARK.



Photograph by G. L. Beam.

SQUARE TOWER HOUSE.

Restoration of this prehistoric cliff dwelling is now going rapidly ahead.

MESA VERDE NATIONAL PARK.

A. A PORTION OF THE FIRST FOREST.

The profusion of petrified wood is clearly shown.

B. ROOT OF PETRIFIED TREE, 7 FEET IN DIAMETER.

The profile resembles a dog's or lion's head.

PETRIFIED FOREST, NATIONAL MONUMENT, ARIZONA.

Photographs by Wm. Nelson.

Photograph by Pacific Stereopticon Co

A. HAVASUPAI INDIAN RESERVATION IN THE CATARACT CANYON.

The walls are deep red sandstone. The older Indians regard the two upstanding rocks as sacred.

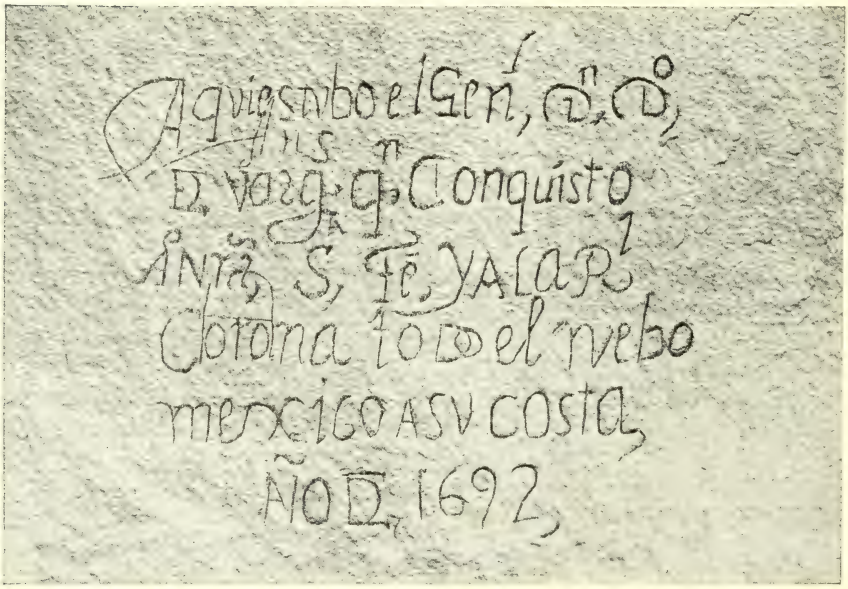
Copyright by F. H. Maude.

B. HAVASUPAI INDIAN WOMAN GRINDING CORN IN A METATE.

These Indians are extremely primitive in their methods and manner of life.

THE TUMACACORI MISSION RUIN.

TUMACACORI NATIONAL MONUMENT, ARIZONA.



Photograph by Jesse Nusbaum.

THE "DE VARGAS" INSCRIPTION ON INSCRIPTION ROCK.

"Here was Gen Don Diego de Vargas, general and conqueror for the Holy Faith and the royal crown of all New Mexico at his own expense in the year 1692."

EL MORRO NATIONAL MONUMENT, NEW MEXICO.

ing the past few years in the various compounds of Casa Grande Ruin. A new well was built during the year, and picnic grounds were made available for visiting motorists, together with parking areas for their automobiles.

The archæological work undertaken included the sinking of test pits in a number of large mounds, together with the digging of trenches preparatory to conducting investigations in these completely covered ruins. An important study was made in an elliptical mound, producing results that led to the conclusion that the building within it was used as a great stadium by the ancient inhabitants of the village. Mr. Pinkley believes that this building was used at least twice a year, once for the purpose of offering prayers for rain and good crops and later for the purpose of offering thanks for the results of the season's harvest.

Custodian Pinkley also acted as custodian of the Tumacacori National Monument and devoted considerable time to the interests of the Petrified Forest National Monument, and after the creation of the Grand Canyon National Park he made a study of certain conditions in that reservation for my personal information.

TUMACACORI NATIONAL MONUMENT, ARIZONA.

This monument was set apart for the purpose of safeguarding the ruins of an old Spanish mission called San Jose de Tumacacori, which belonged to a chain of missions in Arizona, dating from about the year 1730.

Tumacacori Mission was especially well constructed, and although it has been abandoned for many years, its walls are still in a fair state of preservation.

The monument was established on September 15, 1908. At that time it was evident that if certain work was not performed in the way of repairing the walls and the other parts of the mission building it would soon become a tumbled heap of brick and mortar. However, until this year, no funds were available to undertake this work.

In December, 1918, I assigned Custodian Pinkley, of the Casa Grande National Monument, to undertake an inspection of the mission to determine what ought to be done to protect the walls and towers from further decay. On December 9, 1918, Mr. Pinkley was made custodian without additional compensation. During the year he made several trips to the old mission, and under his direction numerous important repairs were made. A heavy concrete foundation was placed under the bell tower, and the east wall of the sacristy was strengthened by liberal use of cement and rock. This wall supported a well-preserved brick roof. A new foundation was put under the east wall of the church, the débris was removed from the floor of the building, and considerable improvement work was performed on the walls and gates of the cemetery which immediately adjoins the mission.

In this work Mr. Pinkley had the hearty support of the chambers of commerce of Nogales and Tucson, Ariz., and of the archæological department of the University of Arizona, which is headed by Prof. Byron S. Cummings, who has taken such an important part in the preservation of prehistoric cliff dwellings and other records of by-

gone civilizations of the Southwest. A considerable portion of the work on the Tumacacori Mission was performed with funds subscribed by these chambers of commerce or allotted by Prof. Cummings from moneys placed in his hands for archæological work.

Much work remains to be done at the Tumacacori Mission, the most important requirement being the construction of a roof over the nave of the church. We shall proceed with this work of essential restoration as fast as funds become available.

GRAN QUIVIRA NATIONAL MONUMENT, NEW MEXICO.

On July 22, 1919, a permit was granted to Dr. Edgar L. Hewett, director of the School of American Research, to excavate in the ruins of the early Spanish mission, which the Gran Quivira Monument was created to preserve. At this writing the report on Dr. Hewett's investigations has not been received.

It should be recalled that the School of American Research purchased private holdings immediately adjoining the monument to protect for scientific study and for the inspection of the interested public several important ruins of the ancient mission group. It is now proposed to extend the monument to include this adjoining tract in order that a fence may be placed around all of the ruins and thus make them secure from acts of vandalism. This extension should by all means be made.

CHACO CANYON NATIONAL MONUMENT, NEW MEXICO.

The proposal to excavate a considerable number of the ruins of the Chaco Canyon National Monument and to restore in whole or in part the very comprehensive irrigation system which the ancient occupants of this region maintained has been revived since the close of the war. Plans now in the course of formulation contemplate that this work shall be undertaken by the Smithsonian Institution, the American School of Research, and the Royal Ontario Museum of the University of Toronto, and that the dam and other works necessary to store water for the irrigation system shall be built by the National Park Service, which will also protect the monument while this work is in progress and afterwards promote it as a tourist resort.

On June 16 a permit was granted to Dr. Clark Wissler, of the American Museum of Natural History, to conduct archæological investigations at the Pueblo Bonito site in the monument. The Pueblo Bonito contained originally about 1,200 rooms, and is one of the biggest prehistoric ruins yet discovered. The permit covers the removal of short sections from some of the timbers in the ruin in order that a special study of the tree rings may be made with a view to determining their relative ages; also the making of a few minor excavations in some of the rooms to check up data secured by the Hyde expedition, on which a publication is about to be issued by the American Museum of Natural History.

DINOSAUR NATIONAL MONUMENT, UTAH.

On February 7, 1919, Dr. W. J. Holland, of the Carnegie Institute, of Pittsburgh, was granted authority to continue excavations in the

Dinosaur National Monument, as a renewal of the authority under which this Institute has been conducting investigations and excavations for several years.

VERENDRYE NATIONAL MONUMENT, NORTH DAKOTA.

A question has arisen as to whether the Indians of the Fort Berthold Reservation ought to be paid by the United States Government for the lands included in the Verendrye National Monument, which embraces Crowhigh Butte and other lands on the Missouri River near Sanish, N. Dak. If the lands are not purchased, and it is proved that they would be valuable for commercial purposes, the national monument should probably be canceled.

It appears, however, that the lands have no commercial value but that they possess unusual historic interest and for this reason are worthy of maintenance as a national monument. Pending a further classification of the lands from the standpoint of commercial development the Office of Indian Affairs has relinquished control of the reservation to our custodian, Mr. W. F. Thompson, of Sanish.

PETRIFIED FOREST NATIONAL MONUMENT, ARIZONA.

This monument is situated near both a transcontinental railroad and an automobile highway, and it has been visited this year by a large number of travelers. Early in the year a fund of $1,000 was expended in the improvement of the section of the highway through one of the principal petrified forests. This work has been a great boon to travel, but it is only a very small part of the work that ought to be done on the highways of the monument.

Other prospective improvement work includes the construction of a bridge over the Rio Puerco, which flows between Adamana, the railroad station, and the north line of the reservation. Road and trail signs for the purpose of directing visitors about the petrified forests are badly needed.

The custodian reports that there is a general disposition on the part of visitors to refrain from taking away specimens of the petrified wood, but that a sufficient number of depredations occur each year to make it advisable to arrange for better supervision of the monument as soon as funds are available to employ a ranger.

NAVAJO NATIONAL MONUMENT, ARIZONA.

In my report of 1917 I enlarged upon the necessity of restoring in full the prehistoric pueblo ruins and cliff dwellings comprising the Navajo National Monument. The Indian appropriation act for May, 1916, made $3,000 available but the amount was so small as to permit excavation of only one ruin. Work, therefore, was concentrated on the restoration of Betatakin (Hillside House), a remarkable cliff dwelling, which was rapidly disintegrating. Unfortunately, however, because of the extremely unseasonable weather and the difficulty of securing competent help and supplies for even the small force engaged, the complete repair of this ruin could not be accomplished before the expiration of that fiscal year. The work was carried on by the Smithsonian Institution, under the capable management of Neil M. Judd, of the National Museum, as field officer in charge.

It is highly desirable that the restoration of other important ruins be commenced without further delay because the ravages of time and the elements are playing havoc with their condition. Keet Seel, an important ruin which is said to be surpassed in size only by the Cliff Palace of the Mesa Verde, should perhaps be attended to first. It is the most instructive prehistoric ruin within the monument and is deserving of speedy restoration. Its masonry is probably more stable than was that of Betatakin in 1917, and with such a favorable existing condition considerable money could be saved by an early start. Inscription House is another ruin of importance. It takes its name from an inscribed record of an early Spanish priest. Photographs show that many of the house walls have already fallen, but with the fallen material in place it would not be difficult to undertake the task of restoration.

The above-cited instances call attention to the importance of the exhibits on this monument. They are to Arizona what the ancient villages of Mesa Verde are to Colorado, and like the latter, will draw an increasing number of visitors from year to year as convenient lines of approach are developed. Five thousand dollars, it is estimated, will afford ample funds to satisfactorily conclude the exploration already begun by the excavation of Betatakin—a small sum indeed compared with the educational and historical value of the structures and the material evidences of their former inhabitants whose early history is constituted by these very structures and the traces of pottery and bone and basketry that are found among them.

In such restoration work operations are commenced by removing from the entire rooms the accumulation of débris, wind-blown sand, and perhaps large masses of rock which have fallen from cave roofs under which the former habitations are sheltered. The talus or slopes below each cave is carefully worked over in search both of discarded artifacts and possible indications of additional dwelling. Then comes the main task of strengthening insecure walls, replacing crumbling foundations, repairing broken roofs or providing new roofs, and building ladders to reach the more inaccessible sections, and the like. In the work of restoration all evidences of white man's handiwork is eliminated as far as practicable; the aboriginal atmosphere of the place is kept by carefully assimilating and adhering to the construction methods employed by the early builders. Binders for the stone blocks in the walls after considerable experimentation have been prepared, which, when placed, can not be distinguished from the old mortar used. In spreading this all traces of tool marks are erased so as to not get away from the evidences of aboriginal handiwork; in fact especial care is taken to leave frequent imprints of the fingers. When stone is to be used in the work of repair, it is roughly shaped with steel hammers and in laying it joints are always broken. The general results are eminently satisfactory, and the most careful inspection, after sufficient time has elapsed to permit weathering, does not disclose the difference between the ancient handiwork and our modern imitation.

The task of rebuilding is not a difficult one, and in the forthcoming estimates for the fiscal year 1921 it is my purpose to submit to you an estimate for the excavation and restoration of all of these prehistoric ruins found on the Navajo National Monument.

EL MORRO NATIONAL MONUMENT, NEW MEXICO.

El Morro, a huge sandstone mesa lying on the historic rock between the new and old Mexicos, in its massive proportions suggested to its early Spanish discoverers the forms of tower and battle and was given the name which stands as their equivalent for "castle." In recent times this monolith has been called Inscription Rock, due to the many inscriptions carved by the early Spanish pioneers in their journeys over that wild western country. Its favorable location on the main trail, with the water, firewood, and shelter afforded at that conspicuous point, made it a favorite resting place, and during their extended halts the conquistadores carved names, titles, and other matters of interest on the smooth, finely-grained surface of the eastern side of the rock. There are many such inscriptions, the details of some of which are ably treated in the Proceedings of the Delaware County Institute of Science for October, 1905.

The problem connected with this monument is the protection of these invaluable inscriptions. Some of the visitors have chipped pieces of the inscription, while others add their names to these ancient records.

The custodian, Mr. Evon Z. Vogt, supervised a number of improvements, but no funds were available for any important work during the year. Because of the work done during the fiscal year 1918 on the Grand-Inscription Rock Road, the State has made an appropriation for work to be done on the Ramah-Gallup Road, fathered by interested people of those towns. During the next year the custodian will be allowed funds to mark trails and place warning signs near the inscriptions, and to open up the spring at the base of the rock for the use of visitors. There are old ruins at the top of the rock and one of the improvements of the future should be to mark the trail to the top. Aside from the unique historical value of the inscribed monolith itself, the ruins on the top may well tempt exploration. With the improvement of the roadway between towns in the neighborhood of this historical stone, it will draw an increasing number of visitors from year to year.

MONTEZUMA CASTLE NATIONAL MONUMENT, ARIZONA.

Under contract with Mr. Alston D. Morse some repairs were made at the Castle during the last fiscal year. Mr. Morse has removed from the neighborhood, and the monument is without a custodian.

An inspection of the Castle by the custodian of the Casa Grande Ruin shows that it is in relatively poor condition. While there has been no falling away of walls, the action of the elements is plainly noticeable. Some of the corners are cracking and the instability of existing foundations are more and more apparent. Unless a complete renovation of the Castle is undertaken, which would entail a considerable amount of money, the best that can be done is to put in brass rods where needed and patch with cement from year to year as the need arises. This would not be the finished job, however, that should be undertaken in the renovation of a prehistoric dwelling, and any extensive repairs should be conducted under the supervision of representatives of the Smithsonian Institution in order that the place may not lose its atmosphere or value. Ladders reaching to the

dwellings are in good condition and are well bolted. Particular attention was given to this feature since a preceding inspection by another party had indicated the insufficiency of the fastenings of the ladder; this was found to be unwarranted.

A resident custodian is much needed and an effort will be made during the coming year to locate some one who would be willing to undertake the charge for the nominal sum that has been set aside for this purpose.

The need of repairs of roads and trails to the Castle is evident, and should be undertaken in the near future. Public interest in the monument is evinced by the continuous run of dates after the names inscribed on the visitors' register. A small sum for this repair work will achieve most satisfactory results.

LEWIS AND CLARK CAVERN NATIONAL MONUMENT, MONTANA.

Oscar Rohn, the custodian of this monument, resigned on June 10, 1919, and since that time the cavern has been placed under the general supervision of the superintendent of Yellowstone National Park. It was opened in June and extensively photographed by a representative of the Pathé Exchange (Inc.).

This cavern contains many extraordinary feaures that would make it very attractive to the traveling public. It is, however, inaccessible at the present time, and we have thought it best not to open the cave to general inspection until such time as it is made easier of approach, and we have the funds available to adequately compensate a resident custodian.

SHOSHONE CAVERN NATIONAL MONUMENT, WYOMING.

The uncompleted trail to Frost's Cave in the Shoshone Cavern National Monument near Cody, Wyo., was finished during the past summer and offered numerous tourists on their way to Yellowstone National Park an opportunity to visit it. As soon as funds are available additional improvements should be made on this trail and such steps as may be practicable should be taken to invite public attention to this side trip from the Cody or eastern approach road to Yellowstone Park.

DEVILS TOWER NATIONAL MONUMENT, WYOMING.

Improvements in the Devils Tower National Monument during the past year were confined to the repair of the road through the monument to the base of the tower and the development of a spring to provide drinking water for tourists. The improvement of this spring will probably encourage a greater use of the monument by campers than has been the case in the past.

SITKA NATIONAL MONUMENT, ALASKA.

This extremely interesting and decidedly unique monument is situated about 1 mile from Sitka, Alaska. There are 18 totem poles on the monument, the highest of which is 60 feet. These poles are carved from red cedar, and when unprotected by paint the wood cracks badly. No repairs or painting had been put on them for

several years, but recently under an allotment of $800 Mr. E. W. Merrill, of Sitka, attended to their partial repair and repainting. They are painted in six colors and require two coats of paint. Where the carvings were broken or decayed they were chiseled out and new cedar wood set in to give the original character to the carving. The rainy weather handicapped the work considerably, but it was completed to the limit of the allotment by the end of the fiscal year. In other parts of the monument dead limbs and trees were removed and burned and other work done. One particularly important improvement was the placing of seats at places where they give the visitor a good view of the Indian River, Sitka Harbor, the islands, the extinct volcano, Mount Edgecomb, and the ocean.

KATMAI NATIONAL MONUMENT, ALASKA.

In my last year's report I dwelled at length upon the creation by the President's proclamation of September 24, 1918, of the Katmai National Monument situated on the southern shore of Alaska about midway of the volcanic belt which has been extraordinarily active for a number of years. The stupendous scenic qualities, awe-inspiring and fearful, of that wonderful region were detailed at some length. I informed you at that time that four expeditions of the National Geographic Society had been sent to this region for exploration and the gathering of scientific and other data. However, during the summer of 1919 the largest exploring party yet sent by the Society to the region of Mount Katmai and the neighboring Valley of Ten Thousand Smokes justified beyond happiest anticipations the setting aside by presidential proclamation of this natural wonder area as a national monument.

The strictly scientific harvest of the 1919 expedition has been unexpectedly large, including not only many specimens of incrustations and gases for analysis and a collection of lavas for petrographic study, but the party is bringing back rare zoological and botanical specimens.

Moreover, members of the expedition, again working under Robert F. Griggs, who made the original explorations for the National Geographic Society, found a series of craters, many of them active, in a previously unexplored arm of the valley, mapped 100 miles of uncharted or incorrectly charted coast line, and found a feasible route, not previously known, from a fine harbor into the midst of the vast area of steaming vents and flowing volcanoes.

For the first time this expedition, which included nearly a score of scientific experts in various fields, also had along motion picture cameras, so that thousands of feet of film are being brought back to make available to the public the scenic wonders of the unique region.

Already assured of the first rank among national parks of the future the appeal of this region is further enhanced by the discovery that the territory to the north of the present national monument area abounds in fish and game. This discovery also may have an important economic bearing upon the development of that portion of Alaska.

OTHER NATIONAL MONUMENTS.

Conditions in several national monuments have remained unchanged during the past year. It is worth noting, however, that each year more people visit them and enjoy their unusual scenic features.

These national monuments either do not require improvement or are not susceptible of development except at an enormous expense covering the cost of constructing many miles of roads and trails.

These are the Pinnacles National Monument, California; Natural Bridges and Rainbow Bridge National Monuments, Utah; Colorado National Monument, Colorado; Papago Saguaro National Monument, Arizona; and Capulin Mountain National Monument, New Mexico.

PERSONNEL NOTES.

The war drew heavily on the field forces of the National Park Service, but with the demobilization of the Army and the Navy most of our former employees are returning to resume their duties, with even keener interest in the preservation of America's scenic resources than they possessed when they withdrew from the civil service. We are glad when these young enthusiasts come back. The parks are safer and better in every way when they are in the hands of such men.

I hope that we may take back every former employee who desires to return and who is qualified for permanent service in the bureau.

WASHINGTON OFFICE UNDERMANNED

There is a most pressing need for more employees in the Washington office of the Service. The bureau was organized in accordance with legislation framed in 1915 before the great development of the national parks began and while there was comparatively little business to transact. The work of the Service has grown by leaps and bounds in the past two years, and now our Washington force has reached the point where constant overtime duty is not sufficient to enable it to keep abreast of the never-ending flood of important official matters. Certainly there can be no similar group of men and women anywhere in the Federal service that is required to expend continually so much mental and physical energy under high pressure as our people have been expending during the past two years in loyal, faithful efforts to successfully operate the central governing organization of the national parks. Most of them deserve higher salaries and nearly all should have more assistance. In my opinion, a lump-sum appropriation should be granted each year to the National Park Service for payment of the salaries of its experts and clerks in Washington. Under such a fund exact justice could be accorded every member of the force. However, more employees and higher salaries even on a statutory roll would go far toward relieving the very serious problem that is confronting the Service.

CHANGES IN PERSONNEL.

On June 10, 1919, Arno B. Cammerer, for several years assistant secretary of the Fine Arts Commission, was appointed assistant director of the National Park Service, to succeed Horace M. Albright, who was appointed superintendent of Yellowstone National Park on that date.

Robert Sterling Yard, chief of the Educational Division of the Service, resigned on June 30, 1919, to become executive secretary of the newly organized National Parks Association.

D. L. Reaburn, superintendent of Mount Rainier National Park, was granted indefinite leave of absence on April 16, 1919, and on May 10 Maj. Roger W. Toll was appointed to fill the vacancy.

Thomas W. Brazell, superintendent of Wind Cave National Park, resigned on March 15, 1919, and his son, Roy, was appointed to succeed him. Prior to entering the Army, the new superintendent had served at a park ranger.

Col. Richard A. Sneed, superintendent of Platt National Park, left the service on June 30, 1919, to become commissioner of Confederate pensions of Oklahoma. He was succeeded on July 16 by Thomas Ferris, formerly superintendent of the Pawnee Indian School.

George B. Dorr, custodian of the Sieur de Monts National Monument, became superintendent of Lafayette National Park shortly after the date the monument was made into the park.

Chester A. Lindsley, chief clerk of Yellowstone National Park, was appointed assistant superintendent of the park, effective July 1, 1919.

A. H. Lynam, chief ranger of Lafayette National Park, was appointed assistant superintendent on May 22, 1919.

William H. Peters, assistant engineer, was designated as acting superintendent of Grand Canyon National Park on August 2, 1919.

The position of examiner of accounts in the field, formerly held by C. G. Smith, was discontinued on March 5, 1919.

Frank Pinkley, custodian of Casa Grande National Monument, was placed in charge of the Tumacacori National Monument on December 9, 1918. He will administer both custodianships.

Oscar Rohn, custodian of Lewis and Clark Cavern National Monument, resigned on June 10, 1919.

LEGISLATION.

I have already discussed in more or less detail the legislation relating to the national-park system that has been enacted by Congress and by the States since the preparation of the last report, and some attention has been given to important pending bills. The text of the new laws will be found in Appendix D of this volume, together with important reports of committees of Congress relating to these laws or pending bills.

For convenient reference the following is a brief summary of the national-park measures enacted into law during the past year or pending in Congress at the present time:

PARK BILLS ENACTED INTO LAW.

SIXTY-FIFTH CONGRESS.

The act of February 25, 1919,[1] entitled "An act to authorize the sale of certain lands at or near Yellowstone, Mont., for hotel and other purposes," authorizes the Oregon Short Line Railroad Co. to

[1] 40 Stat., 1152. See text of law on p. 1215.

purchase a tract of land near the western entrance to Yellowstone Park and adjacent to the grounds upon which the company's station and other terminal buildings are located. The tract is to be used as a site for a new hotel which is planned for the early future. The operation of the hotel will be subject to the regulations of the Secretary of the Interior under the following provision of the law:

Provided, however, That any hotel erected on said lands shall be operated by the said Oregon Short Line Railroad Co., or its successors in interest, under such rules and regulations as the Secretary of the Interior my prescribe for the conduct and operation of hotels within the Yellowstone National Park.

The act of February 26, 1919,[1] entitled "An act to establish the Grand Canyon National Park," changed the Grand Canyon of the Colorado region in Arizona from the status of a national monument to that of a national park. This was S. 390 of the Sixty-fifth Congress, introduced by Senator Ashurst, of Arizona, and mentioned on pages 95 and 236 of my 1918 report. It passed the Senate on May 16, 1918, was reported from the Public Lands Committee of the House on October 18, 1918, and passed the House on January 20, 1919.

The act of February 26, 1919,[2] entitled "An act to establish the Lafayette National Park in the State of Maine," added the Sieur de Monts National Monument to the national park system and changed the name of the area. This measure was S. 4957 of the Sixty-fifth Congress, introduced by Senator Hale, of Maine. It passed the Senate on October 3, 1918, was reported from the Committee on Public Lands of the House on January 15, 1919, and passed the House on February 17, 1919. This legislation was covered in last year's report on pages 95, 238, 239, and 240.

The act of March 1, 1919,[3] entitled "An act to repeal the last proviso of section 4 of the act to establish the Rocky Mountain National Park in the State of Colorado, and for other purposes, approved January 26, 1915," withdrew the inhibition on the appropriation of more than $10,000 annually for Rocky Mountain National Park, thus opening the way for the development of this important reservation. This legislation was H. R. 171 of the Sixty-fifth Congress, introduced by Mr. Timberlake, of Colorado. It was described on pages 95 and 241 of last year's report. It was passed by the House of Representatives on February 3, 1919, and by the Senate on February 21, 1919. It superseded S. 1555, by Senator Shafroth, which was passed by the Senate on February 5, 1918.

SIXTY-SIXTH CONGRESS.

The sundry civil appropriation act of July 19, 1919,[4] carried appropriations of $754,195 for the National Park Service in Washington and for the administration, protection, maintenance, and improvement of the various national parks and monuments. It also reappropriated $140,000, contained in the sundry civil act of July 1, 1918,[5] for the construction of a new administrative building and free

[1] 40 Stat., 1175. See text of law on p. 1215.
[2] 40 Stat., 1178. See text of law on p. 1218.
[3] 40 Stat., 1270. See text of law on p. 1218.
[4] Public No. 21, 66th Congress.
[5] 40 Stat., 679.

bathhouse at Hot Springs, Ark. This act also transferred control of road improvement in Crater Lake National Park from the War Department, Corps of Engineers, to the Interior Department.

STATE LEGISLATION.

The Legislature of California passed a law ceding to the United States exclusive jurisdiction over Yosemite, Sequoia, and General Grant National Parks. The act was approved by Gov. William D. Stephens on April 15, 1919.[1]

The Legislature of Montana enacted legislation[2] which had for its purpose the better protection of the national parks of Montana from poaching. If all national park States would enact similar measures there would be opportunities for better cooperation in game protection than now exist.

BILLS NOT APPROVED BY LAST CONGRESS.

Among the important national-park measures before the Sixty-fifth Congress the following were passed by one House but failed of enactment in the other:

H. R. 13350,[3] "A bill to add certain lands to Yellowstone National Park," introduced by Mr. Mondell on December 12, 1918, provided for the enlargement of Yellowstone Park to include the Teton Mountains and other lands south of the present park. This bill superseded H. R. 11661, introduced on April 24, 1918, and mentioned in last year's report on pages 40 and 96. It was reported from the Public Lands Committee of the House of Representatives on January 16, 1919, and was passed by the House on February 17. On February 18 it was reported from the Senate Committee on Public Lands. Objection was made to the bill when it was brought up for passage in the Senate, and the end of the session came before it was again reached on the calendar. H. R. 1412, a bill identical with this measure, is now pending in the Sixty-sixth Congress.

S. 2021,[4] "A bill to add certain lands to Sequoia National Park," introduced by Senator Phelan, of California, on April 21, 1917, was reported by the Senate Committee on Public Lands on January 16, 1919, with an amendment changing the name of the proposed enlarged park to Roosevelt National Park. On the same day the bill was passed by the Senate. In the House Committee on the Public Lands hearings were held on the bill on January 21, and on February 12 the measure was reported with the recommendation that the name of the existing Sequoia National Park be changed to Roosevelt National Park. The provisions of the bill relating to the extension of the park were stricken out. The bill in this emasculated form was not considered by the House before the end of the session.

Meanwhile H. R. 14624, "A bill to add certain lands to the Sequoia National Park, California, and to change the name of said park to Roosevelt National Park," was introduced by Mr. Elston, of Cali-

[1] See text of the law on p. 1220.
[2] See text of the law on p. 1220.
[3] See committee report on p. 1233.
[4] See report of Senate Committee on Public Lands, p. 1221, report of the House committee on p. 1224, and excerpts from the Congressional Record on p. 1232.

fornia. The measure superseded H. R. 10929, introduced by Mr. Elston on March 21, 1918. This bill provided merely for extending the boundaries of Sequoia Park. In view of the progress made by S. 2021, neither of these measures was considered.

S. 5323,[1] "A bill to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park," introduced on January 13, 1919, by Senator Saulsbury, of Delaware, proposed to grant authority under which certain exchanges of territorial lands in Hawaii might be made for private holdings in Hawaii National Park. On February 25 it was reported favorably by the Committee on the Pacific Islands and Porto Rico and was passed by the Senate on the same day. However, it did not receive the attention of the House before the close of the session.

H. R. 13699,[2] substantially the same as S. 5323, was introduced by Mr. Kalanianaole on January 7, and on February 21 was reported favorably by the Committee on the Territories.

S. 4439, "A bill to provide for the survey of a national highway connecting certain national monuments in the States of Utah, Arizona, and New Mexico," was passed by the Senate on January 21, 1919. This bill was considered on pages 16, 96, and 242 of the annual report for 1918. It was not considered by the House of Representatives before the end of the session. It was reintroduced in the Sixty-sixth Congress as S. 35, by Senator King.

All of the bills listed on page 96 of the last report and the following measures also failed of passage in the last session of Congress:

S. 5039, introduced by Senator Smoot on November 21, 1918, and S. 5048, introduced by Senator King on the same day, proposed to give to Zion National Monument the status of a national park.

S. 5228, "A bill for an addition to Rocky Mountain National Park," introduced by Senator Shafroth on December 23, 1918, proposed to add the Mount Evans region to Rocky Mountain National Park. It superseded S. 3587, "A bill to establish the Denver National Park," introduced on January 21, 1918.

H. R. 14624, "A bill to eliminate private land holdings in General Grant National Park," was introduced by Mr. Elston, of California, on January 17, 1919.

PENDING NATIONAL PARK LEGISLATION.

Among the national park legislation now pending are the following bills:

H. R. 3184, a general water power bill identical so far as it relates to the national parks with S. 1419 of the Sixty-fifth Congress, passed the House of Representatives on July 1, 1919. It grants authority to a Federal Power Commission composed of the Secretaries of the Interior, War, and Agriculture, to issue power permits in national parks and monuments "only after a finding by the commission that the license will not interfere or be inconsistent with the purpose for which such reservation was created or acquired, and shall be subject to and contain such conditions as the secretary of the department under whose supervision such reservation falls, shall deem necessary for the adequate protection and utilization of such reservation." The

[1] See Senate committee report on p. 1240.
[2] See House committee report on p. 1239.

term "reservation" is defined as "lands and interest in lands owned by the United States and withdrawn, reserved, or withheld from private appropriation and disposal under the public-land laws, and land and interest in lands acquired and held for any public purpose."

Under section 17 of the act 50 per cent of the charges arising from licenses for the development of power in the national parks is reserved and appropriated as a special fund to be expended in the improvement and development of the parks.

As stated on page 94 of my last report, if the provisions of this bill are administered wisely, no harm should come to the parks, because wherever it appears that a project may result in injury to a park the permit can be denied. In Yosemite, Sequoia, General Grant, Rocky Mountain, Hawaii, Mount McKinley, and Grand Canyon Parks power permits may be issued under provisions of law similar to those in the pending bill. Some of these parks have been subject to these special provisions for many years, and in Yosemite and Sequoia Parks power plants have been installed without injuring them or interfering with their use.

S. 425,[1] "A bill to establish the Zion National Park in the State of Utah," introduced by Senator Smoot on May 20, 1919, is identical with S. 5039 of the previous session, mentioned above. On June 20 the bill was favorably reported by the Committee on Public Lands and was passed by the Senate the same day. It was reported favorably by the House Committee on the Public Lands on August 26. It was passed by the House with two minor amendments and is now in conference. Its early passage is expected.

S. 38, introduced by Senator King on May 20, also provides for the establishment of Zion National Park.

H. R. 6644, introduced by Mr. Welling, of Utah, on June 25, likewise proposes to establish the Zion National Park.

H. R. 1412, "A bill to add certain lands to Yellowstone National Park," was introduced on May 21 by Mr. Mondell. This bill is identical with H. R. 13350 of the Sixty-fifth Congress, considered above.[2] It proposes to add the Teton Mountains and other scenic territory to Yellowstone Park.

S. 1391, "A bill to add certain lands to Sequoia National Park and to change the name of said park to Roosevelt National Park," was introduced on June 5, 1919, by Senator Phelan. This measure is identical with S. 2021 of the Sixty-fifth Congress as it was passed by the Senate on January 16, 1919.

H. R. 5006, identical with S. 1391, was introduced on June 5 by Mr. Elston.

H. R. 3654, "A bill to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park," was introduced on May 28, 1919, by Mr. Kalanianaole. This measure is identical with H. R. 13699 and substantially the same as S. 5323 of the Sixty-fifth Congress, already mentioned as having been passed by the Senate on February 25. The pending bill was reported favorably by the Committee on the Territories on July 21.[3]

[1] See Senate committee report on p. 1242.
[2] See report on p. 1244.
[3] See committee report on p. 1239.

H. R. 7971, "A bill to accept the cession by the State of California of exclusive jurisdiction over the lands embraced within the Yosemite National Park, Sequoia National Park, and General Grant National Park, respectively, and for other purposes," was introduced on July 29 by Mr. Raker, of California.

H. R. 8039, similar to H. R. 7971, was introduced on July 30 by Mr. Elston.

Both of these bills propose to accept the jurisdiction tendered by the California legislation[1] already mentioned.

S. 666, "A bill creating the National Park of the Cliff Cities," introduced by Senator Jones, of New Mexico, on May 23, 1919, proposes to make the Bandelier National Monument and adjacent country a national park.

S. 2374, "A bill to establish the Pajarito National Park," introduced by Senator Jones, of New Mexico, on July 1, is a measure proposed as an alternative for the Cliff Cities Park bill.

H. Res. 159, introduced on July 8, 1919, by Mr. Lea, of California, proposes to call upon the Secretary of the Interior to study the question of acquiring some of the coast redwoods of California for a national park.

S. 2797, "A bill to add certain lands to Crater Lake National Park," was introduced by Senator McNary, of Oregon, on August 15, 1919. The bill is identical with S. 4283 of the Sixty-fifth Congress.

Other bills pending provide for the creation of the Mississippi Valley National Park in Iowa and Wisconsin, the Mammoth Cave National Park in Kentucky, the Mount Baker, Yakima, and Grand Coulee National Parks in the State of Washington, the Killdeer National Park in North Dakota, and the Mount Katahdin National Park in Maine.

PRESIDENTIAL PROCLAMATIONS.

No proclamations affecting the national-park system have been issued by the President during the period covered by this report, but by Executive order of February 28, 1919, the land lying north of Yellowstone National Park, in the watershed of the Yellowstone River and between the Gallatin and Absaroka National Forests, was again withdrawn in aid of plans to establish better facilities for caring for elk and other animals when they drift out of the park in winter. This land was originally withdrawn by the President on April 16, 1917. The text of the latest Executive order will be found on page 306.

As stated earlier in the report, there are monument projects pending which include, first, the group of ancient ruins known as Aztec Springs in the Montezuma Valley, Colorado; second, the towers and castles of the Hovenweep district, near the boundary line between Colorado and Utah; third, Scotts Bluff, the peculiar natural landmark in Nebraska; and, fourth, a tract of land in California on which the rather rare species of palm, *Washingtonia filamentosa*, is still to be found.

NEEDS OF THE NATIONAL PARK SERVICE.

Last year I listed in this section of the report a number of urgent needs of the Service. Several of these have since been met by legis-

[1] See text of California law on p. 1220.

lative action, including the creation of the Grand Canyon and Lafayette National Parks and the removal of the inhibition on the appropriations for Rocky Mountain National Park.

Among the present requirements of the Service or of the various parks are the following:

1. An increase in the personnel of the Washington office of the Service, and a general expansion of the bureau in other directions made necessary by the enormous increase in its activities.

2. The enlargement of Yellowstone National Park to include the Teton Mountains, the headwaters of the Yellowstone River, and other lands south of the park.

3. The extension of Sequoia National Park northward and eastward as herein recommended, and the dedication of this area as the Roosevelt National Park in memory of the late ex-President.

4. The extension of Crater Lake National Park to include the Diamond Lake region immediately north of the park.

5. The addition of the Mount Evans region west of Denver to Rocky Mountain National Park.

6. The changing of the south boundary of Mount Rainier National Park to make Ohanepecosh Hot Springs a part of the park.

7. The acceptance by Congress of jurisdiction over Yosemite, Sequoia, and General Grant National Parks tendered by recent act of the legislature of California.

8. The appropriation of funds for establishing a protective force of rangers in Mount McKinley and Lassen Volcanic National Parks.

9. The adoption by Congress of a comprehensive road-building program for the national parks, with commitments as to appropriations for the period of years required to carry out the program.

10. Safeguarding of trees along highways in and leading to several national parks, and along interpark roads, with special attention to the preservation of trees along roads in or approaching Yosemite, Glacier, and Mount Rainier Parks, where the timber has passed from the Federal Government into private hands.

11. The establishment of a national touring division in the National Park Service with power to work in cooperation with the railroads, automobile associations, highway organizations, commercial and travel clubs, etc., in the encouragement of travel in this country.

12. A continuance of the effective aid of the Bureau of Service, National Parks and Monuments, established by the United States Railroad Administration after the railroads of the Nation are returned to their owners.

13. The creation of game preserves adjacent to several national parks, notably Yosemite, Crater Lake, and Mount Rainier Parks, in order that better protection may be given to wild animals when they are driven from the parks by snow.

IN CONCLUSION.

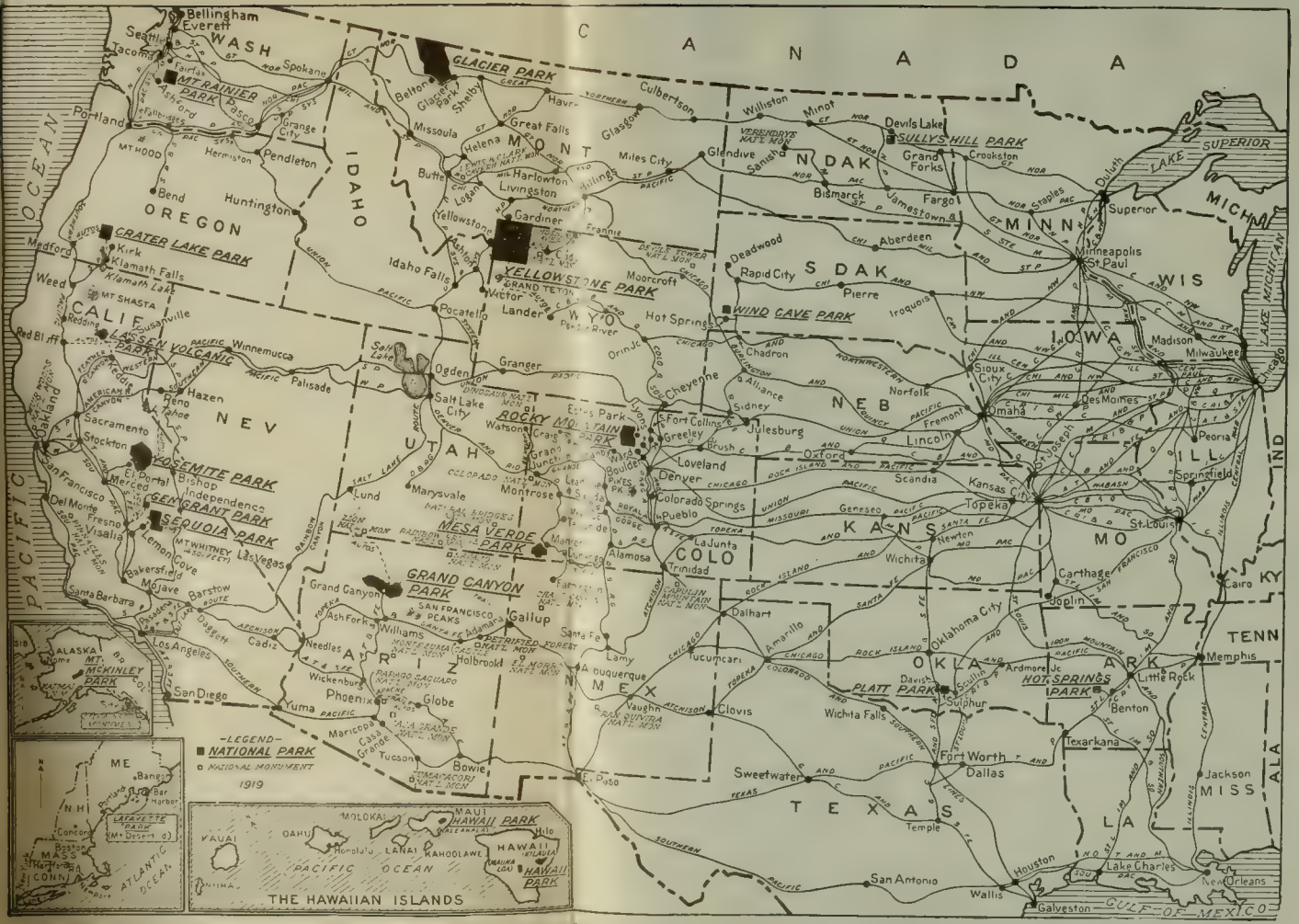
I come to the end of this report filled with satisfaction and pride in the achievements of the National Park Service. It has had a part in making happy, healthful vacations for three-quarters of a million people of this Nation. It has managed and protected vast playgrounds that will bring pleasure and refreshment to mil-

lions yet to use them. It has participated extensively in the conservation of the wild life of the country. It has more than fulfilled the obligations imposed upon it by law, more than performed the duties required of it by the policies of the department, and all in the interest of America of to-day and of the future. It has not been easy to accomplish conspicuous results in this year of high costs and human unrest, and without the loyal, earnest, self-sacrificing endeavor of the employees of the Service nothing worth while could have been done in the face of the emergencies and difficult problems that confronted us.

Very respectfully,

STEPHEN T. MATHER,
Director.

THE SECRETARY OF THE INTERIOR.



EIGHTEEN NATIONAL PARKS CONTAINING 10 739 SQUARE MILES OR 6 872 960 ACRES, AND TWENTY-THREE NATIONAL MONUMENTS, CONTAINING 1,931 SQUARE MILES OR 1,235,840 ACRES ADMINISTERED BY THE NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR.

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APPENDIX A.

THE NATIONAL PARKS AND MONUMENTS.

Map showing location of all national parks and monuments administered by National Park Service, Department of the Interior. See opposite page.

The national parks administered by the National Park Service, Department of the Interior.

The national military and other parks administered by the War Department.

The national monuments administered by the National Park Service, Department of the Interior.

The national monuments administered by the Department of Agriculture.

The national monuments administered by the War Department.

Organization of the National Park Service.

THE NATIONAL PARKS.

ADMINISTERED BY THE NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR.

[Number, 18; total area, 10,739 square miles; chronologically in order of creation.]

Name.	Location.	When established.	Statute reference.	Area (square miles).	Area (acres).	Private lands (acres).	Visitors, 1919.	Special characteristics.
Hot Springs Reservation	Middle Arkansas	Apr. 20, 1832	4 Stat., 505..... 21 Stat., 288.....	1½	911.63	None.	[2] 160,490	46 hot springs possessing curative properties—Many hotels and boarding houses—20 bath-houses under public control.
Yellowstone	Wyoming, Montana, and Idaho.	Mar. 1, 1872	17 Stat., 32, 33...	[1] 3,348	2,142,720	None.	62,261	More geysers than in all rest of world together—Boiling springs—Mud volcanoes—Petrified forests—Grand Canyon of the Yellowstone, remarkable for gorgeous coloring—Large lakes—Waterfalls—Vast wilderness inhabited by deer, elk, bison, moose, antelope, bear, mountain sheep, etc.—Greatest wild bird and animal preserve in world.
Sequoia (sē-kwoi'ȧ)	Middle eastern California..	Sept. 25, 1890	26 Stat., 478, 650.	252	161,597	3,049.81	30,443	The Big Tree National Park—12,000 sequoia trees over 10 feet in diameter, some 25 to 36 feet in diameter—Towering mountain ranges—Startling precipices—Cave of considerable size—Fine trout fishing.
Yosemite (yō-sĕm'-I-tē).	do	Oct. 1, 1890	26 Stat., 650..... 33 Stat., 702..... 34 Stat., 831.....	1,125	719,622.4	[4] 17,800	58,362	Valley of world-famed beauty—Lofty cliffs—Romantic vistas—Waterfalls of extraordinary height—3 groves of big trees—Large areas of snowy peaks—Waterwheel Falls—Good trout fishing.
General Grant	do	do	26 Stat., 650.....	4	2,536	160	21,574	Created to preserve the celebrated General Grant Tree, 35 feet in diameter—6 miles from Sequoia National Park.
Mount Rainier (rā-nēr')	West central Washington..	Mar. 2, 1899	30 Stat., 993.....	324	207,360	18.2	55,232	Largest accessible single peak glacier system—28 glaciers, some of large size—48 square miles of glacier, 50 to 500 feet thick—Wonderful subalpine wild-flower fields.
Crater Lake	Southern Oregon	May 22, 1902	32 Stat., 202.....	249	159,360	2,458.11	16,645	Lake of extraordinary blue in crater of extinct volcano, no inlet, no outlet—Sides 1,000 feet high—Interesting lava formations—Fine fishing.
Wind Cave	South Dakota	Jan. 9, 1903	32 Stat., 765.....	17	10,899.22	None.	26,312	Cavern having many miles of galleries and numerous chambers of considerable size containing many peculiar formations.
Platt	Southern Oklahoma	July 1, 1902 Apr. 21, 1904	32 Stat., 641, 655. 33 Stat., 220.....	1⅓	848.22	None.	[3] 25,000	Many sulphur and other springs possessing medicinal value.

Sully's Hill	North Dakota	Apr. 27, 1904	33 Stat., 322, 323, 2338.	1½	780	None.	4,026	Small park with woods, streams, and a lake—Is an important wild-animal preserve.
Mesa Verde (mā'sa vĕr'dē).	Southwestern Colorado	June 29, 1906 June 30, 1913	34 Stat., 616..... 38 Stat., 82, 83, 84.	77	48,966.4	993	2,287	Most notable and best preserved prehistoric cliff dwellings in United States, if not in the world.
Glacier (gla'sher)	Northwestern Montana	May 11, 1910	36 Stat., 354.....	1,534	981,681	16,508.1[1]	18,956	Rugged mountain region of unsurpassed Alpine character—250 glacier-fed lakes of romantic beauty—60 small glaciers—Precipices thousands of feet deep—Almost sensational scenery of marked individuality—Fine trout fishing.
Rocky Mountain	North middle Colorado	Jan. 26, 1915 Feb. 14, 1917	38 Stat., 798..... 39 Stat., 916.....	397½	254,327	[2] 20,693	[2] 169,492	Heart of the Rockies—Snowy range, peaks 11,000 to 14,250 feet altitude—Remarkable records of glacial period.
Hawaii (ha-wi'e)	Hawaiian Islands	Aug. 1, 1916	39 Stat., 432.....	118	75,295	[2] 41,000	[3]	3 separate areas: 2—Kilauea, continuously active for century, and Mauna Loa, altitude 13,675 (largest active volcano in world, erupting every decade), are on Hawaii; Haleakala, on Maui, 10,000 feet high, with tremendous rift in summit 8 miles across and 3,000 feet deep; contains many cones, gorgeous tropical forests, mahogany groves, and lava caves; erupted 200 years ago.
Lassen Volcanic (las'en)	Northern California	Aug. 9, 1910	39 Stat., 442.....	124	79,561.58	880	[2] 2,500	Only active volcano in United States proper—Lassen Peak, 10,465 feet in altitude—Cinder Cone, 6,879 feet—Hot springs—Mud geysers—Ice caves—Majestic canyons—Numerous lakes—Fine forests.
Mount McKinley	South central Alaska	Feb. 26, 1917	39 Stat., 938.....	2,200	1,498,000	None.	[3]	Highest mountain in North America (altitude 20,300 feet)—Rises higher above surrounding country than any other mountain in world.
Grand Canyon [5]	North central Arizona	Jan. 11, 1908 Feb. 26, 1919	35 Stat., 2175.... 40 Stat., 1175....	958	613,120	[3] 732.16	37,745	The greatest example of erosion and the most sublime spectacle in the world.
Lafayette [6]	Maine coast	July 8, 1916 Feb. 26, 1919	39 Stat., 1785.... 40 Stat., 1178....	8	5,000	None.	[2] 64,000	The group of granite mountains upon Mount Desert Island.

[1] In Wyoming, 3,114 square miles; in Montana, 198 square miles; in Idaho, 36 square miles.
[2] Estimated.
[3] No record kept.
[4] By recent transaction, not yet formally completed, the private holdings have been reduced to approximately 10,800 acres.
[5] Formerly Grand Canyon National Monument.
[6] Formerly Sieur de Monts National Monument; donated to the United States.

THE NATIONAL MILITARY AND OTHER PARKS.

ADMINISTERED BY THE WAR DEPARTMENT.

[Number, 7; total area, 22 square miles; chronologically in order of creation.]

Name.	Location.	When established.	Statute reference.	Area (acres).	Special characteristics.
Chickamauga and Chattanooga	Georgia and Tennessee	Aug. 19, 1890	26 Stat., 333, 978	6,543	Beautiful natural park—Embraces battle fields of Chickamauga and Missionary Ridge and scenes of other conflicts of the Civil War fought in the vicinity of Chattanooga during 1863.
Antietam Battle Field	Maryland	Aug. 30, 1890	26 Stat., 401	50	Scene of one of the greatest battles of the Civil War.
Shiloh	Tennessee	Dec. 27, 1894	28 Stat., 597	3,546	Natural park embracing the battle field of Shiloh near Pittsburg Landing.
Gettysburg [1]	Pennsylvania	Feb. 11, 1895	28 Stat., 651	2,451	Beautiful natural park—Scene of Civil War combat—Probably better marked than any other battle field in the world.
Vicksburg	Mississippi	Feb. 21, 1899	30 Stat., 841	1,323	Beautiful natural park—Scene of the siege and surrender of Vicksburg in 1863 during the Civil War.
Lincoln's Birthplace [1]	Kentucky	July 17, 1916	39 Stat., 385		Contains the log cabin and part of the farm where Abraham Lincoln was born.
Guilford Courthouse	North Carolina	Mar. 2, 1917	39 Stat., 996	125	Near Greensboro—Scene of one of the great battles of the Revolution; fought in 1781.

[1] Donated in whole or in part to the United States.

THE NATIONAL MONUMENTS.

ADMINISTERED BY THE NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR.

[Number, 23; total area, 1,931 square miles; chronologically in order of creation.]

Name.	Location.	Date of creation.	Statute reference of proclamation.	Area (acres).	Special characteristics.
Devils Tower	Wyoming	Sept. 24, 1906	34 Stat., 3236	1,152	Remarkable natural rock tower, of volcanic origin, 1,200 feet in height.
Montezuma Castle	Arizona	Dec. 8, 1906	34 Stat., 3265	[1] 160	Prehistoric cliff-dwelling ruin of unusual size situated in a niche in face of a vertical cliff. Of scenic and ethnological interest.
El Morro	New Mexico	Dec. 8, 1906 June 18, 1917	34 Stat., 3264 40 Stat., Proc., 1377.	160 240	Enormous sandstone rock eroded in form of a castle, upon which inscriptions have been placed by early Spanish explorers. Contains cliff-dweller ruins. Of great historic, scenic, and ethnologic interest.
Petrified Forest	Arizona	Dec. 8, 1906 July 31, 1911	34 Stat., 3266 37 Stat., 1716	25,625	Abundance of petrified coniferous trees, one of which forms a small natural bridge. Is of great scientific interest.
Chaco Canyon (old No. 55)	New Mexico	Mar. 11, 1907	35 Stat., 2119	[1] 20,629	Numerous cliff-dweller ruins, including communal houses, in good condition and but little excavated.

Muir Woods [2] (mūr)	California	Jan. 9, 1908	35 Stat., 2174	295	One of the most noted redwood groves in California, and was donated by Hon. William Kent, ex-Member of Congress. Located 7 miles from San Francisco.
Pinnacles	do	Jan. 16, 1908	35 Stat., 2177	2,080	Many spirelike rock formations, 500 to 1,000 feet high, visible many miles; also numerous caves, and other formations.
Natural Bridges	Utah	Apr. 16, 1908	35 Stat., 2183	120	3 natural bridges, among largest examples of their kind. Largest bridge is 222 feet high, 65 feet thick at top of arch; arch is 28 feet wide; span, 261 feet; height of span, 157 feet. Other two slightly smaller.
		Sept. 25, 1909	36 Stat., 2502	[1] 2,740	
		Feb. 11, 1916	39 Stat., 1764	[1] 2,740	
Lewis and Clark Cavern [2]	Montana	May 11, 1908	35 Stat., 2187	160	Immense limestone cavern of great scientific interest, magnificently decorated with stalactite formations. Now closed to public because of depredations by vandals.
		May 16, 1911	37 Stat., 1679	160	
Tumacacori (tū-mä-kä'kō-rē)	Arizona	Sept. 15, 1908	35 Stat., 2205	10	Ruin of Franciscan mission dating from seventeenth century. Being restored by National Park Service as rapidly as funds permit.
Navajo (năv'á-hō)	do	Mar. 20, 1909	36 Stat., 2491	[1] 600	Numerous pueblo, or cliff-dweller ruins, in good preservation.
		Mar. 14, 1912	37 Stat., 1733	360	
Zion	Utah	July 31, 1909	36 Stat., 2488	[1] 15,840	Magnificent gorge (Zion Canyon), depth from 800 to 2,000 feet, with precipitous walls. Of great beauty and scenic interest.
		Mar. 18, 1918	40 Stat., Proc., 1435.	[1] 76,800	
Shoshone Cavern (shō-shō'nē)	Wyoming	Sept. 21, 1909	36 Stat., 2501	210	Cavern of considerable extent, near Cody.
Gran Quivira (grän kē-vē'rä)	New Mexico	Nov. 1, 1909	36 Stat., 2503	[1] 160	One of the most important of earliest Spanish mission ruins in the Southwest. Monument also contains Pueblo ruins.
Sitka	Alaska	Mar. 23, 1910	36 Stat., 2601	[1] 57	Park of great natural beauty, and historic interest as scene of massacre of Russians by Indians. Contains 16 totem poles of best native workmanship.
Rainbow Bridge	Utah	May 30, 1910	36 Stat., 2703	160	Unique natural bridge of great scientific interest and symmetry. Height 309 feet above water, and span is 278 feet, in shape of rainbow.
Colorado	Colorado	May 24, 1911	37 Stat., 1681	13,883	Many lofty monoliths, and is wonderful example of erosion, and of great scenic beauty and interest.
Papago Saguaro (pä'pä-gō sä-gwä'rō)	Arizona	Jan. 31, 1914	38 Stat., 1991	2,050	Splendid collection of characteristic desert flora and numerous pictographs. Interesting rock formations.
Dinosaur (dī'nō-sôr)	Utah	Oct. 4, 1915	39 Stat., 1752	80	Deposits of fossil remains of prehistoric animal life of great scientific interest.
Capulin Mountain (kăp'ū-lĭn)	New Mexico	Aug. 9, 1916	39 Stat., 1792	681	Cinder cone of geologically recent formation.
Verendrye (vĕr-rŏn-drē)	North Dakota	June 29, 1917	40 Stat., Proc., 1380.	253.04	Includes Crowhigh Butte, peculiar mountain formation, from which Explorer Verendrye first beheld territory beyond Missouri River.
Casa Grande (kä'sä grän'dä)	Arizona	Mar. 2, 1889 [3]	25 Stat., 961	480	These ruins are one of the most noteworthy relics of a prehistoric age and people within the limits of the United States. Discovered in ruinous condition in 1694.
		Dec. 10, 1909	36 Stat., 2504		
		Aug. 3, 1918	40 Stat., Proc., 1470.		
Katmai (kăt'mī)	Alaska	Sept. 24, 1918	40 Stat., Proc., 1487.	[1] 1,088,000	Wonderland of great scientific interest in the study of volcanism. Phenomena exist upon a scale of great magnitude. Includes "Valley of Ten Thousand Smokes."

[1] Estimated.

[2] Donated to the United States.

[3] From Mar. 2, 1889, until Aug. 3, 1918, classified as a National Park

THE NATIONAL MONUMENTS.

ADMINISTERED BY THE DEPARTMENT OF AGRICULTURE.

[Number, 10; total area, 509½ square miles; chronologically in order of creation.]

Name.	Location.	Date of creation.	Statute reference of proclamation.	Area (acres).	Special characteristics.
Gila Cliff Dwellings (hē'lä)	New Mexico	Nov. 16, 1907	35 Stat., 2162	160	Numerous cliff-dweller ruins of much interest and in good preservation.
Tonto	Arizona	Dec. 19, 1907	35 Stat., 2168	[1] 640	Do.
Jewel Cave	South Dakota	Feb. 7, 1908	35 Stat., 2180	[1] 1,280	Limestone cavern of much beauty and considerable extent, limits of which are as yet unknown.
Wheeler	Colorado	Dec. 7, 1908	35 Stat., 2214	300	Of much interest from geological standpoint as example of eccentric erosion and extinct volcanic action. Of much scenic beauty.
Mount Olympus	Washington	Mar. 2, 1909	35 Stat., 2247	608,640	Contains many objects of great and unusual scientific interest, including many glaciers. Is summer range and breeding ground of the Olympic elk.
		Apr. 17, 1912	37 Stat., 1737	608,480	
		May 11, 1915	39 Stat., 1726	299,370	
Oregon Caves	Oregon	July 12, 1909	36 Stat., 2497	480	Extensive caves in limestone formation of much beauty; magnitude not entirely ascertained.
Devil Postpile	California	July 6, 1911	37 Stat., 1715	800	Spectacular mass of hexagonal basaltic columns, like an immense pile of posts. Said to rank with famous Giant's Causeway in Ireland.
Walnut Canyon	Arizona	Nov. 30, 1915	39 Stat., 1761	960	Contains cliff dwellings of much scientific and popular interest.
Bandelier (Băn-dē-lēr')	New Mexico	Feb. 11, 1916	39 Stat., 1764	22,075	Vast number of cliff-dweller ruins, with artificial caves, stone sculpture, and other relics of prehistoric life.
Old Kasaan (kä-sän')	Alaska	Oct. 25, 1916	39 Stat., 1812	38.3	Abandoned Indian village in which there are numerous remarkable totem poles and other objects of historical interest.

[1] Estimated.

THE NATIONAL MONUMENTS.

ADMINISTERED BY THE WAR DEPARTMENT.

[Number, 2; total area, 6 acres; chronologically in order of creation.]

Name.	Location.	Date of creation.	Statute reference of proclamation.	Area (acres).	Special characteristics.
Big Hole Battle Field [1]	Montana	June 23, 1910		5	Site of battlefield on which battle was fought Aug. 9, 1877, between a small force of United States troops and a much larger force of Nez Perce Indians, resulting in rout for the Indians.
Cabrillo (kä-brēl'yŏ)	California	Oct. 14, 1913	38 Stat., 1965	1	Of historic interest because of discovery of the territory now partly embraced in the State of California by Juan Rodriguez Cabrilloo, what this point first sighted land on Sept. 28, 1542.

[1] Set aside by Executive order.

ORGANIZATION OF THE NATIONAL PARK SERVICE.

Stephen T. Mather, director.
Arno B. Cammerer, assistant director.

FIELD SERVICE.

ENGINEERING DIVISION.

George E. Goodwin, civil engineer.
William H. Peters, assistant engineer.
Charles P. Punchard, jr., landscape engineer.

THE NATIONAL PARKS.

Crater Lake, Alex Sparrow, superintendent.
Glacier, W. W. Payne, superintendent.
Grand Canyon, William H. Peters, acting superintendent.
Hot Springs, Dr. Wm. P. Parks, superintendent.
Lafayette, Geo. B. Dorr, superintendent.
Mesa Verde, Thomas Rickner, superintendent.
Mount Rainier, Roger W. Toll, superintendent.
Platt, Thomas Ferris, superintendent.
Rocky Mountain, L. C. Way, superintendent.
Sequoia, Walter Fry, superintendent.
General Grant, Walter Fry, acting superintendent.
Sullys Hill, Samuel A. M. Young, acting superintendent.
Wind Cave, Roy Brazell, superintendent.
Yellowstone, Horace M. Albright, superintendent.
Yosemite, W. B. Lewis, superintendent.

THE NATIONAL MONUMENTS.

Capulin Mountain, Mrs. W. H. Jack, custodian.
Casa Grande, Frank Pinkley, custodian.
Colorado, John Otto, custodian.
El Morro, Evon Z. Vogt, custodian.
Muir Woods, Andrew Lind, custodian.
Navajo, John Wetherill, custodian.
Papago Saguaro, J. E. McClain, custodian.
Petrified Forest, Wm. Nelson, custodian.
Tumacacori, Frank Pinkley, acting custodian.
Verendrye, W. F. Thompson, custodian.
Zion, Walter Ruesch, custodian.

No superintendents or custodians have been appointed for the Hawaii, Lassen Volcanic, or Mount McKinley National Parks, or for the Chaco Canyon, Devils Tower, Dinosaur, Gran Quivira, Katmai, Lewis and Clark Cavern, Montezuma Castle, Natural Bridges, Pinnacles, Rainbow Bridge, or Shoshone Cavern National Monuments.

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HOT SPRINGS RESERVATION.

Dr. Wm. P. Parks, superintendent, Hot Springs, Ark.

GENERAL STATEMENT.

In making my fifth annual report since my incumbency as superintendent of the Hot Springs Reservation, it is a great pleasure to be able to report a substantial increase in the business of the bathhouses as well as the number of visitors to this resort as compared with the preceding year.

During the present fiscal year the total number of baths sold in the different pay bathhouses was 729,997 as compared with 704,975 last year, making a gain of 25,022 paid baths. The total receipts of these bathhouses this year were $346,974.46 as compared with the total receipts of $332,791.12 last year, showing a net gain of $14,183.34. The net profits reported by these bathhouses this year were $127,475.64, while the net profits last year were $127,911.74, making a slight decrease as compared with the net profits of last year, occasioned by the great increase in the cost of maintaining and operating the bathhouses. In addition to the total number of paid baths, 1,844 complimentary baths were given at the pay bathhouses, 87,040 baths were given at the government free bathhouse, and 5,445 baths were given at the Leo N. Levi Memorial Hospital Bathhouse, a charitable institution, making a grand total of 824,326 baths given during the fiscal year, including paid baths, an increase of 21,591 over last year.

It is conservatively estimated that 160,491 persons visited Hot Springs during the present fiscal year. A large number of these visitors were persons of high standing in business and financial affairs of the country, and some writers of national reputation; also quite a number of Members of both branches of Congress with whom this health-pleasure resort is extremely popular. All seem to be of one accord in the firm belief that the future holds great things in store for Hot Springs.

LEGENDARY HISTORY.

There is no positively authentic historical information available at this late date concerning the discovery of these hot springs, but it is reasonable to presume from traditions handed down that the world-famous hot springs were discovered by nomadic, primitive races, and their sanitary waters used for many generations before the adventurous Ponce de Leon set foot in the western wilds. The footprints of ages are visible still in the ground strata of tufa rock formation found on the mountain sides, rusty with evidence of hoary antiquity.

These hot springs have been known since the commencement of American history, for they were mentioned by the early Spanish historians as being the "fountain of youth" sought by Ponce de Leon and said to have been found by De Soto in 1541, too late to restore him to health. According to tradition the healing properties of these waters must have been known to the Indians long before the advent of the Spaniards, for there are many legends to support this belief. The evolution of the city of Hot Springs from the tepees and wigwams of the Indians to the present world-renowned cosmopolitan watering place has been gradual but constant.

From all reliable information available which can be considered of sufficient weight to be historical evidence, it has been established that the earliest white settlers came here in the year 1800. Dunbar and Hunter, of the expedition of Lewis and Clark, visited Hot Springs in December, 1804, and their report shows they found an open log cabin and a few huts of split boards, all calculated for summer encampment, which had been erected by persons resorting to the springs for the recovery of their health. Manuel Prudhomme built a cabin here in 1807 and was joined the same year by John Percival and Isaac Cates, who remained here and engaged in hunting and trapping.

From that time to the present the history of the springs is complete and shows that their fame has gradually spread, and each succeeding year has added to their patronage and prestige.

RADIOACTIVITY OF THE WATERS.

In 1904 the Secretary of the Interior authorized Dr. Bertram B. Boltwood, of Yale University, to report on the radioactivity of the waters. The following résumé of Dr. Boltwood's conclusions appeared in the annual report of the Secretary of the Interior for 1904:

"* * * The results of the electroscopic tests of the gases obtained by boiling the waters were very satisfactory, as they showed that the waters at Hot Springs are radioactive to a marked degree; and from other tests, taken to determine the properties of the emanations from the waters, it was found that the properties of these radioactive gases were identical with those of the radium emanation.

"On the other hand, when the water from which the gas had once been taken was boiled a second time, after being allowed to stand, no radioactivity was detected in the gas obtained from the second boiling, and it was therefore concluded that little or no radium salts existed in the waters. This conclusion was strengthened by the fact that

a test of the residue of the waters which had been left by evaporation also failed to disclose any sign of radioactivity of this solid substance. A sample from the tufa deposit, formed by some of the springs on issuing from the ground, was also tested, and it was found that the amount of radium contained in 100 grams of tufa was less than one one-millionth of the quantity of radium, associated with an equal weight of uranium in pitchblende. Samples of the gas which arose from the springs were also tested, and its radioactivity was found to be less than of an equal volume of gas obtained by boiling the waters from the springs. The following conclusions are reached by Dr. Boltwood as the result of his investigations:

"1. The waters of the springs on the Hot Springs Reservation are all radioactive to a marked degree.

"2. The radioactivity of the waters is due to dissolved radium emanation (a gas), and not to the presence of salts of radium or other radioactive solids."

This report has, in a great measure, lifted the veil of mystery heretofore surrounding the healing agencies which have so long proved their efficacy in the restoration to health of suffering humanity.

RESERVATION.

The Hot Springs Reservation at present contains 911.63 acres. The original reservation was established by act of Congress approved April 20, 1832, in which it is provided "that the hot springs in Arkansas Territory, together with four sections of land, including said springs as near the center as may be, shall be reserved for the future disposition of the United States, and shall not be entered, located; or appropriated for any other purpose whatever." Under the provisions of this act the S. ½ of secs. 28 and 29 and all of secs. 32 and 33, T. 2 S., R. 19 W. of the fifth principal meridian, and the N. ½ of secs. 4 and 5, T. 3, R. 19 W., were set aside and designated as the original Hot Springs Reservation, and contained 2,529.1 acres.

Of this tract of land, which was laid off in blocks, lots, streets, alleys, etc., by a commission under authority of act of Congress approved March 3, 1877, all except the present 911.63 acres and a few scattering unsold Government lots has been disposed of and now comprises the heart of the city of Hot Springs.

By act of Congress approved June 16, 1880, Hot Springs, North, West, and Sugar Loaf Mountains were forever reserved from sale and dedicated for public use as a park, having an area of 900.63 acres; to which was added, by authority vested in the Secretary of the Interior, what is known as Whittington Lake Park, containing 11 acres, making a total area of 911.63 acres in the permanent Hot Springs Reservation.

By this act also the streets, courts, alleys, and other thoroughfares of the town of Hot Springs, Ark., as surveyed, opened, and established by the commission and not included in the permanent reservation, were ceded and dedicated to the corporation of the city of Hot Springs for public use.

The hot springs issue forth at the foot of the west slope of Hot Springs Mountain. Their aggregate flow now under control is 851,308 gallons daily. The hot-water supply of the various bathhouses is derived from these springs, and all revenues collected therefrom are, under the direction of the Secretary of the Interior, expended in the improvement, development, and beautification of the reservation, which is now coupled with the national parks throughout the United States, and administered by the Director of the National Park Service, through the superintendent of the reservation appointed by the Secretary of the Interior.

The superintendent has charge of all general matters pertaining to the Government's interests, is disbursing officer, enforces the rules and regulations of the department, has charge of sanitation, hydrotherapy, and bathing of patients at the government free bathhouse for the indigent, and supervision of bath attendants and their fitness for employment.

CITY OF HOT SPRINGS.

This charmingly novel and quaint city of more than 16,000 population, which derives its name from the thermal springs which flow from the mountain side, is situated near the geographical center of the State of Arkansas. It nestles away in the beautiful and romantic valley which opens fanlike to the southeast into a gradually undulating country, almost surrounded by the breaks and spurs of the Ozark Mountains, slightly more than 50 miles from Little Rock, the busy State capital, and 4 miles from the picturesque Ouachita River.

The city of Hot Springs was incorporated April 5, 1876, and became a city of the first class March 13, 1879. The commission form of government under which its affairs are now being administered has proven quite satisfactory, and, while the revenues recently have been insufficient to meet the requirements of progressive development, provisions have this year been made to provide the necessary revenue by the inauguration of an occupation tax, which when put in operation will relieve this situation.

Hot Springs is fortunate in having all the public utilities and modern features of a city many times its size.

The city commission is composed of five representative and progressive citizens, one of whom is mayor, who, together with the city manager, have at all times evidenced a willingness to cooperate with this office in matters looking to the advancement of this resort.

The beautiful settings surrounding Hot Springs create scenic environments which make it particularly attractive to the visiting public.

ADMINISTRATION.

During the past year there have been comparatively few violations of the rules and regulations governing the Hot Springs Reservation, as the policy of this office to continue to require a strict compliance with the provisions of the rules has had a wholesome effect in deterring persons who might be inclined to overstep the bounds. Persons who may have heretofore been inclined to violations now realize that it is to the best interests of all concerned to adhere to the rules laid down by the Government.

The increased patronage this year has necessarily added to the duties pertaining to administration, and in these matters I have had the hearty cooperation of the employees.

The wants of the large number of visitors applying daily for information of various kinds have been supplied in such manner as to facilitate in every way possible their visit to Hot Springs. This is deemed a most important feature, as the train inspectors in their speech extend a general invitation to all persons seeking information to call at the superintendent's office, and courteous treatment is a potent factor in giving the visitor a favorable first impression, which is always lasting.

The system of records in the superintendent's office, which requires daily, monthly, and annual reports showing the business of the bathhouses, has been continued and kept in such manner as to furnish complete information in connection with their operation.

Particular attention has been given to the regular inspection of all bathhouses receiving water from the Hot Springs Reservation, with the result that any deficiencies whatever were called to the attention of the managers and rectified without delay. In this connection the managers of the bathhouses have shown a disposition of cooperation at all times and have assisted generally in keeping the service at a high standard.

The sets of rules and regulations governing the bathhouses receiving hot water from the Hot Spring Reservation, the Federal Registration Board, government free bathhouse, and bath attendants in all pay bathhouses were revised and a new set of rules governing masseurs, masseuses, and mercury rubbers were approved by the department and are now in force.

DRUMMING.

A very close supervision has resulted in keeping down doctor drumming to such an extent that there is practically no complaint on this score. However, I may state that occasionally something occurs which indicates that the practice is not entirely eradicated, but cases of this kind are immediately investigated, and in this way persons who may be inclined to violate the drumming rule are deterred from so doing, for they know that as soon as sufficient evidence is secured charges will be filed against them, and the past support of this department leaves no doubt in their minds that punishment will be meted out to them.

The practical elimination of the drumming evil is highly appreciated by the visiting public and is the subject of much favorable comment, which fully demonstrates the appreciation of the work heretofore done toward stamping it out.

OFFICIAL VISITORS.

During the month of November the Hot Springs Reservation was honored with visits by Mr. Stephen T. Mather, director of the National Park Service, and Mr. J. J. Cotter, administrative assistant to the Secretary of the Interior, also Mr. Howard H. Hays, manager of the Bureau of Service of the United States Railroad Administration. During their stay here they met and conferred with a large number of the leading citizens, discussing the requirements of Hot Springs generally, thereby securing information which will be of benefit in future administration of affairs pertaining to the reservation.

On the night of November 26 the director and his party were tendered a banquet at the Arlington Hotel, at which the most representative citizens of Hot Springs were gathered. On this occasion he expressed in an address his views with reference to the future improvements contemplated for Hot Springs Reservation, and at the same time pointed out some improvements which should be properly carried out by the city. His suggestions were well received and highly appreciated. Pleasing talks were made by Mr. Cotter and Mr. Hays, the latter dwelling on the fact that the name of Hot Springs Reservation might be changed, with benefit, to Hot Springs National Park, in order that it might be identified with all the other national parks.

The visit of the director and his party was highly appreciated by the citizens of Hot Springs, and it is believed much will be accomplished as a result.

Early in December Mr. Jens Jensen, the noted landscape artist of Chicago, visited the reservation at the request of the Director of the National Park Service in the interest of the future beautification of this resort. While here Mr. Jensen met a large number of Hot Springs leading citizens who are deeply interested in the civic beauty of the city and offered valuable suggestions in the line of landscape work for the reservation and city generally, which were well received and highly appreciated.

The First Assistant Secretary of the Interior, Mr. Alexander T. Vogelsang, accompanied by Mrs. Vogelsang, and also his secretary, Mr. J. G. Massey, arrived here on the morning of June 30 for an extended stay. This was Secretary Vogelsang's first visit to this resort, and there is no doubt that the result will be beneficial for its future development. At different times he met and discussed with citizens who are deeply interested in Hot Springs' progress matters pertaining to this resort, thereby gaining a better understanding of its needs. The visit of this high official has been greatly appreciated here, and his coming is counted a signal honor.

These official visits are considered of great benefit. They will show good results from the fact that those officials directing the affairs of the reservation from Washington are enabled to come in closer touch and gather information more effectively than can be accomplished through correspondence.

EMPLOYEES.

At the end of the fiscal year there were 26 employees engaged in the administration, maintenance, and protection of the Hot Springs Reservation, all of whom were appointed from Arkansas. A table showing the name, designation, and compensation of each employee follows.

Name.	Designation.	Compensation per annum.
William P. Parks	Superintendent	$3,600
B. Frank Bayley	Chief clerk and assistant to superintendent	1,800
Evelyn H. Moore	Clerk-stenographer	1,100
Martin Winn (colored)	Male attendant	660
Van Cannon (colored)	do	660
Elisha W. Baziel (colored)	do	660
William M. Dixon (colored)	do	660
Mattie Fielding (colored)	Female attendant	528
Mary Clark (colored)	do	528
Jonathan A. Jordan	Foreman	1,386
Montgomery Prichard	Policeman	924
George W. Withrow	do	924
Richard L. Gaffney	Policeman (detailed as train inspector)	1,188
Harry J. Tully	do	1,188
Peter Nelson	Laborer	792
William F. Jennings	do	792
Jap George	do	792
David W. Peda	do	792
Charles F. Reedy	do	792
John E. Stinnett	do	792
Jesse N. Hay	do	792
Hugh McCollum	do	792
Thomas J. Turner	do	660
James Daniels (colored)	do	660
Oliver H. Hoskins (colored)	do	660
Rufus M. Moore (colored)	do	660

Since my last annual report, Adelbert N. Byers, attendant at the government free bathhouse; Hiram N. Anderson, policeman (detailed as train inspector); and William H. Turner, policeman, have resigned, and the services of Bruno Hoffman, laborer, were discontinued without prejudice. George W. Withrow, policeman, and Harry J. Tully, policeman (detailed as train inspector), have been appointed. At the end of the fiscal year there remained four vacant positions to be filled.

All employees who were eligible under act of Congress approved June 3, 1918, received increased compensation at the rate of $120 per annum.

RECEIPTS AND DISBURSEMENTS.

Receipts and disbursements on account of Hot Springs Reservation for the fiscal year ended June 30 were as follows:

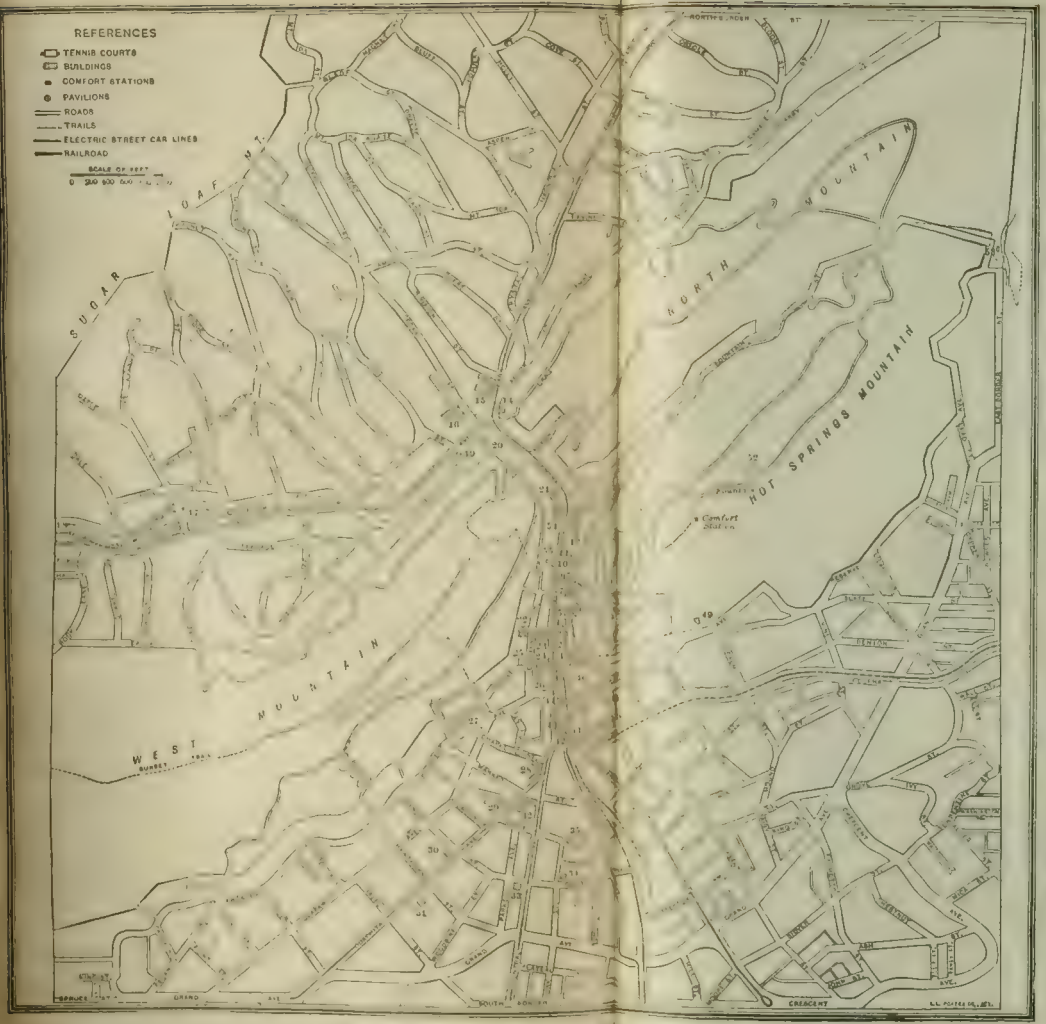
Proceeds sale of lots, special fund.

July 1, 1919, balance remaining to credit of fund of $82,518 derived from sale of government lots		$4,972.49

Protection and improvement Hot Springs Reservation, indefinite (revenue fund).

July 1, 1918, balance to credit of revenue fund		51,062.03
Receipts from July 1, 1918, to June 30, 1919, inclusive:		
Water rents	$29,490.00	
Ground rents	22,600.00	
Sale of attendants' badges	18.15	
Sale of Oertel System maps	1.00	
Total receipts		52,109.15
Total available		108,143.67
Disbursements:		
Salaries of superintendent and reservation employees	26,526.70	
Vouchers approved by superintendent and forwarded to the department for payment, including traveling expenses	4,935.70	
Expended by the superintendent	31,462.40	
Additional expended by the department	668.19	
	32,130.59	
Disallowed by auditor	.23	
Total disbursements		32,130.36
Available balance July 1, 1919		76,013.31
Salaries of regular employees on reservation, account increase of compensation, Department of the Interior, 1919		3,238.66

Back ground rent from the Arlington Hotel Co., for the period April 1, 1917, to June 30, 1918, $12,500, payment of which was withheld pending consideration of application for readjustment of rental, was collected.



MAP OF PORTION OF HOT SPRINGS RESERVATION

LEGEND.

The numbers in this list refer to the numbers on the map:

1. Superintendent's office.
2. Lamar bathhouse.
3. Buckstaff baths.
4. Ozark bathhouse.
5. Magnesia bathhouse.
6. Government free bathhouse.
7. Fordyce bathhouse.
8. Main entrance to reservation
9. Maurice bathhouse.
10. Hale bathhouse.
11. Superior bathhouse.
12. Arlington Hotel and baths.
13. Superintendent's residence (old).
14. Rockafellow Hotel and bath
15. Majestic Hotel and baths.
16. St. Joseph's Infirmary and baths
17. Whittington Lake Park.
18. Keeper's residence.
19. First Presbyterian Church.
20. Catholic Church.
21. Reeter bathhouse and Waukesha Hotel.
22. Milwaukee Hotel.
23. Pullman Hotel.
24. Arkansas National Bank.
25. Masonic Temple.
26. First Baptist Church.
27. Leo N. Levi Memorial Hospital and bathhouse.
28. Goddard Hotel.
29. Alhambra bathhouse.
30. Moody Hotel and baths.
31. Court House.
32. Como Hotel.
33. Central Methodist Church.
34. High School Building.
35. Ozark Sanitorium bathhouse.
36. Missouri-Pacific Depot.
37. Rock Island Depot.
38. City Hall and Auditorium Theatre.
39. Business Men's League.
40. Post Office.
41. Great Northern Hotel.
42. Citizens' National Bank.
43. Marquette Hotel.
44. Arkansas Trust Company.
45. Security Bank.
46. Eastman Hotel and baths.
47. Elks' Club.
48. Episcopal Church.
49. Superintendent's residence (new).
50. Imperial bathhouse.
51. Pump house (pumps water to drinking fountains at summit of Hot Springs Mountain).
52. Tower.
53. Iron Spring (cold).
54. Dugan-Stuart Building.
55. Thompson Building.

North, West, and Hot Springs Mountains and Whittington Lake Park form the permanent Hot Springs Reservation, owned and operated by the Government.

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IMPROVEMENTS AND MAINTENANCE.

As was the case last year, no extensive permanent improvements have been made during this year by reason of the fact that some complications arose in connection with the proposed construction of the new administration building, free bathhouse, and clinic, all of which now appear to have been removed, so that it is possible that these buildings may be completed and in use before June 30, 1920. Provision has been made in the sundry civil act for 1920 for expenditures totaling $190,000 for this purpose.

Extreme care has been taken in the maintenance of the improvements on the reservation, and it is believed the reservation never presented a more attractive appearance than during this year. It has taxed our regular force of laborers to the utmost to keep up this work. It has been necessary to devote much time to the maintenance and upkeep of the system of mountain roadways, which is one of the most pleasing features of this resort. During the year 946 yards of gravel have been hauled and distributed at points where necessary for building up and surfacing the roads. The gutters and catch basins on the sides of the roads have been kept thoroughly cleaned out, and the roads dragged and grassed as occasion required.

Special attention has been given to the cultivation of hedges, shrubbery, and flowers. An unusually severe winter caused the top of the beautiful box hedge along the reservation front to freeze and die, so that it became necessary to cut the hedge down to a height of about 8 inches in order to facilitate its growth. In some instances the roots had died, and it was necessary to set out new plants. It has been carefully cultivated and its renewed growth has been rapid.

During his visit here in November the director of the National Park Service took much interest in the beautification of the reservation, and ordered a larger quantity of bulbs for planting this year than has been customary heretofore. Approximately 9,930 tulips of various colors, 4,000 narcissus, and 1,500 red, white, and blue hyacinths, a total of approximately 15,430 bulbs, were received and planted on the reservation. About the time these bulbs were received, and at the instance of the director, Mr. Jens Jensen, the famous landscape artist of Chicago, came to visit the reservation, and made suggestions as to planting, arrangement of color schemes, etc., which were carried out, with the result that during the early spring the reservation presented an unusually beautiful appearance, which elicited expressions of favorable comment from the visiting public. The roses also have been extremely beautiful this year, as have all the plants and shrubbery in their season, due to the careful cultivation received.

All lawns on the reservation, including the west slope of Hot Springs Mountain, have been kept neatly trimmed. Winter grass seed was sown in November, so that the lawns might retain their greenish hue during the winter months, which makes them exceptionally attractive to visitors.

The 423 four-foot park benches were repaired and thoroughly painted with two coats of paint. When finished and distributed for use they had the appearance of new benches. All the White Way electric-light poles on the reservation front were given two coats of paint, the body and arms being an attractive pea green, and bronze green base. All the electric-light poles along Hot Springs Mountain road and in Whittington Lake Park were given a coat of black paint. All the hand railings across concrete bridges and at various danger points where precipices occur were also given a coat of black paint.

Much work has been done in Whittington Lake Park to promote its attractiveness, and it is becoming more popular each year. Repairs were made on the tennis court. The three old toilet equipments were removed from the brick comfort station and three modern toilets installed therein, bringing it to a satisfactory sanitary condition.

A quantity of fallen timber which had accumulated on the reservation was cut up and 98 cords of wood secured for fuel, most of which was used at the government free bathhouse.

All pumps, pipe, and sewer lines have been maintained by repairs and renewed wherever necessary.

GOVERNMENT FREE BATHHOUSE.

The Government free bathhouse has been operated during the past year for the indigent in accordance with the acts of Congress of December 16, 1878, and March 2, 1911, with the following results:

Total applications for free baths	4,480
Number refused	174
Tickets issued to—	
White males	1,817
White females	328
Colored males	1,262
Colored females	899
Total tickets issued on original applications	4,306
Tickets reissued to—	
White males	1,365
White females	304
Colored males	718
Colored females	329
Total number of tickets reissued	2,716
Total tickets issued to—	
White males	3,182
White females	632
Colored males	1,980
Colored females	1,228
Total number of tickets, including reissues	7,022

Baths given to—	
White males	41,432
White females	7,495
Colored males	24,072
Colored females	14,041
Total number baths given	87,040

The average number of persons bathed daily at the free bathhouse was 285.

By reference to the above table, it is noted that there is a decrease of 10,590 in the total number of baths given as compared with last year. The strict compliance required with act of March 2, 1911, which provides that only persons without and unable to obtain funds to pay for baths shall be eligible to admission to the free bathhouse, is largely responsible for this decrease, together with the fact that it appears that more people are able to pay for baths than formerly on account of the prosperous condition of the country generally.

This bathhouse has filled a most worthy mission to diseased and suffering humanity which otherwise would be unable to avail itself of the great benefits to be derived from bathing in these healing waters. The existence of this old institution is nearing an end, as in its stead, on another location, a free bathhouse and clinic is to be constructed on most substantial and modern lines, and equipped with all modern facilities. Block 82 of the city of Hot Springs, Ark., which is on the opposite side of Reserve Avenue from the reservation, has been offered by the city of Hot Springs and tentatively accepted by the department as the site for the new free bathhouse and clinic, and an appropriation of $190,000 provided for in the current sundry civil act for its construction, less the amount which will be required for the new administration building.

FREE CLINIC.

The free clinic which is operated in the rooms over the government free bathhouse has been continued during the fiscal year ended June 30, 1919. The physicians engaged in this work are registered and give a portion of their time between the hours of 1 and 3 p. m. each day except Sundays and legal holidays. The only persons treated here are indigent free bathers who can not secure funds with which to pay for professional services. Despite the inconvenience on account of insufficient quarters and equipment and the lack of laboratory facilities the report from the clinic shows a gain over last year.

The Wassermann and other blood and serum tests were made in connection with cases treated for the purpose of diagnostic confirmation.

A report from the genito-urinary clinic states that 249 cases were treated with the following results:

No results, due to insufficient treatment	61
Slight improvement	65
Much improvement	58
Cured	65

The daily average attendance in the various months was from 10 to 30; mean average, 20. The approximate number of personal treatments given was 6,200. The following diseases were treated in this clinic:

Gonorrhea, acute and chronic; cystitis; urethral stricture; prostatic hypertrophy; rheumatism, gonococcal; epididimitis, gonococcal.

The skin-syphilis clinic was operated continuously during the fiscal year. The report shows the following results obtained, with the 278 cases treated:

Insufficient observation	87
Slightly improved	21
Much improved	170

The daily average attendance during the various months was from 5 to 12. These cases were treated for syphilis, primary, secondary, and tertiary.

The results of observations of these cases in connection with the baths confirm the studies made by the physicians and given in my report for the fiscal year ended June 30, 1918.

The continued observations made by the physicians relative to the therapeutic value of the water confirm the studies made before, and mentioned somewhat in detail in my 1918 report. The effects of the baths on the body temperature, the polynuclear cells and phagocytic power of the blood encourage the belief that the benefits derived from the Hot Springs mineral water are due to its action on metabolism and elimination, and the medical conditions most benefited are those in which the disturbances are due to a toxemia, either of bacterial or metabolic origin.

The 527 dismissed or leaving the genito-urinary and skin-syphilis clinics during the year came from the following States:

	Genito-urinary.	Skin syphilis.	Total.
Alabama	6	9	15
Arkansas	51	37	88
California	2	2	4
Canada	1		1
Colorado	2	5	7
Delaware	1		1
Florida	1	2	3
Georgia	3	7	10
Illinois	18	20	38
Indiana	4	6	10
Iowa	2	6	8
Kansas	6	4	10

	Genito-urinary.	Skin syphilis.	Total.
Kentucky	3	4	7
Louisiana	12	10	22
Maryland	1	.....	1
Massachusetts	.....	2	2
Michigan	3	4	7
Minnesota	5	3	8
Mississippi	15	16	31
Missouri	23	30	53
Montana	1	1	2
Nebraska	3	2	5
New Jersey	2	3	5
New Mexico	2	1	3
New York	3	6	9
North Carolina	3	1	4
North Dakota	.....	1	1
Ohio	1	3	4
Oklahoma	20	33	53
Pennsylvania	6	3	9
South Dakota	.....	1	1
Tennessee	15	17	32
Texas	25	26	51
Virginia	1	4	5
Washington	2	4	6
West Virginia	3	1	4
Wisconsin	3	3	6
District of Columbia	.....	1	1
Total	249	278	527

The work accomplished at the free clinic this year is commendable and has served to facilitate the progress of a large number of patrons of the government free bathhouse who otherwise would have been unable to secure any treatment or medical advice on account of lack of funds to pay for such services. The physicians who have given their time to this work may be assured their services have been appreciated.

In the plans for the new free bathhouse, which are now being completed, provision has been made for a modern and up-to-date clinic, the arrangement of which has been gone over very carefully in connection with several physicians who are deeply interested in this work. The plans have been arranged in such manner as to detail that, when completed, the clinic should be satisfactory in every respect. It is intended to have a technician in charge of the laboratory, records, etc., whose services will greatly facilitate the work of the clinic's staff of physicians.

PAY BATHHOUSES.

There are at the present time 19 pay bathhouses receiving hot water from the Hot Springs Reservation, with the following rates for baths, fixed in each instance by the Secretary of the Interior, in effect therein:

Bathhouse.	Single baths.	Course of 21 baths.
Alhambra	$0.40	$7.00
Arlington	.65	12.00
Buckstaff	.60	11.00
Eastman	.55	10.00
Fordyce	.65	12.00
Hale	.50	9.00
Imperial	.55	10.00
Lamar	.45	8.00
Magnesia	.40	7.00
Majestv	.55	10.00
Maurice	.60	11.00
Moody	.50	9.00
Ozark	.40	7.00
Ozark Sanitor um	.45	8.00
Pythian (colored)	.35	6.00
Rector	.45	8.00
Rockafellow	.45	8.00
Superior	.50	9.00
St. Joseph's Infirmary	.50	9.00

In addition to the above, there is a uniform attendant's fee, also fixed by the Secretary of the Interior, of 20 cents for a single bath, or $4 per course of 21 baths, which is collected by the bathhouse manager and properly accounted for to the attendant.

All bathhouses sell half-rate tickets for 10 baths and some of the bathhouses sell quarter tickets for 5 baths at one-half and one-fourth, respectively, of the rates shown above for a full course of 21 baths.

There are at present 23 hot water and ground leases in force, as shown by the following table:

Hot water and ground leases.

Name of bathhouse, etc.	Lessee.	Tubs.	Date of lease.	Expiration.
Alhambra	Alhambra Bathhouse Co	18	Mar. 1, 1919	Feb. 28, 1922
Arlington [1]	Arlington Hotel Co	92	Mar. 21, 1914	Mar. 3, 1932
Buckstaff	Buckstaff Bathhouse Co	31	Jan. 1, 1912	Dec. 31, 1931
Eastman [1]	New York Hotel Co	89	May 13, 1912	May 12, 1932
Fordyce	S. W. Fordyce, jr., trustee	30	Jan. 1, 1915	Dec. 31, 1934
Hale	Mercantile Trust Co., trustee	25	do	do
Horseshoe [2]	D. Fellows Platt	30	Jan. 1, 1895	Dec. 31, 1909
Imperial	Chas. N. Rix	27	Jan. 1, 1912	Dec. 31, 1931
Lamar [3]	M. C. Tombler and G. H. Buckstaff	30	Jan. 1, 1897	Dec. 31, 1916
Levi Memorial	Leo N. Levi Memorial Hospital Association.	5	Nov. 1, 1914	Oct. 31, 1924
Magnesia [3]	Chas. B. Platt	30	Jan. 1, 1895	Dec. 31, 1909
Majestic [1]	Avenue Hotel Co	23	Jan. 1, 1913	Dec. 31, 1932
Maurice	Maurice Bath Co	29	Jan. 1, 1912	Dec. 31, 1931
Moody [1]	Nicholas N. Moody	16	July 1, 1910	June 30, 1920
Ozark [3]	W. S. Sorrells and F. B. Latta	25	Jan. 1, 1904	Dec. 31, 1913
Ozark Sanitorium	Ozark Sanitorium Co	10	Sept. 17, 1912	Sept. 16, 1922
Pythian (colored)	Knights of Pythias (colored)	10	Dec. 16, 1914	Dec. 15, 1924
Rector	Elias W. Rector estate	12	Apr. 16, 1914	Apr. 15, 1924
Rockafellow	Mahala J. Rockafellow	18	July 1, 1918	June 30, 1920
St. Joseph's Infirmary [1]	Sister Superior	10	Feb. 1, 1914	Jan. 31, 1924
Superior	Superior Bathhouse Co	20	Feb. 15, 1916	Feb. 14, 1936
Arlington Hotel, ground lease	Arlington Hotel Co		Mar. 21, 1914	Mar. 3, 1932
Hot Springs Mountain Observatory, ground lease.	Hot Springs Mountain Observatory Co.		Sept. 1, 1913	Sept. 1, 1923

[1] Water used in private bathrooms in portion of tubs leased.
[2] Closed Dec. 31, 1915.
[3] Tenants holding over.

There is no doubt that the finest bathhouses in the world are located in Hot Springs, as this has been stated by a number of persons who have visited all the first-class bathing establishments in Europe. Those bathhouses constructed within the past few years contain all modern equipment and practical appliances. A high standard of service is maintained in all bathhouses at all times. Frequent official inspections have added materially to the efforts of the managers in obtaining such good results.

The total business of the various bathhouses has shown a substantial increase over last year, which is satisfactory to the lessees. However, on account of the great increase in cost of maintenance and operation, a slight decrease in net profits is shown. This is not unexpected, since there has been no increase in the price of baths since January 1, 1916, and the increase in cost of maintaining bathhouses since that date has been great.

The time for tearing down all the old frame bathhouses and rebuilding new houses on the sites of the Horseshoe, Ozark, Lamar, and Magnesia Bathhouses has been extended to June 1, 1920, at which time the hot-water supply will be cut off from these houses and they will be torn down, and it is probable construction of new and modern bathhouses on these sites will be begun. When these are completed the reservation front will present a magnificent row of beautifully designed, modern, and up-to-date bathhouses.

Total receipts, less redemptions, of bathhouses, by months, for fiscal year ended June 30, 1919.

Bathhouse.	July.	August.	September.	October.	November.	December.	January.
Alhambra	$912.20	$896.40	$544.20	$355.60	$414.45	$683.40	$1,306.50
Arlington	1,247.45	1,323.30	1,260.50	1,179.25	1,670.80	1,959.15	3,939.45
Buckstaff	1,838.50	2,260.39	1,395.41	909.65	1,140.10	1,111.05	2,971.05
Eastman							905.00
Fordyce	2,964.12	3,358.68	1,597.18	1,613.48	1,561.02	1,606.83	5,286.18
Hale	1,660.15	1,776.05	986.10	887.75	753.65	1,031.35	2,060.70
Imperial	1,887.20	1,466.45	1,221.25	739.75	950.10	1,327.05	2,459.60
Lamar	1,458.50	1,252.70	837.20	668.90	818.55	755.90	1,553.60
Magnesia	1,170.35	1,229.05	932.25	749.10	873.50	665.10	1,188.15
Majestic	1,405.60	1,567.90	793.25	649.35	913.40	888.50	2,134.30
Maurice	2,936.40	2,154.40	1,745.55	1,333.35	1,554.05	2,098.15	5,879.15
Moody	768.54	615.24	407.70	355.74	406.30	470.56	1,067.98
Ozark	1,943.95	1,748.90	1,076.50	1,355.25	1,087.35	1,197.20	1,712.40
Ozark Sanitorium	421.40	502.20	346.95	137.60	224.95	292.70	618.80
Pythian (col)	643.04	808.77	596.70	357.40	318.75	382.00	651.90
Rector	559.40	604.60	258.35	332.05	291.55	379.95	442.85
Rockafellow	1,132.83	1,230.04	776.88	650.80	410.70	652.45	1,439.95
Superior	1,651.90	1,630.65	1,097.30	1,022.00	878.45	1,008.45	2,153.45
St Josephs Infirmary	328.70	304.30	201.25	120.95	179.65	207.50	366.30
Total	24,930.23	24,730.02	16,074.52	13,417.97	14,447.32	16,717.29	38,737 31

Total receipts, less redemptions, of bathhouses, by months, for fiscal year ended June 30, 1919—Continued.

Bathhouse.	February.	March.	April.	May.	June.	Total
Alhambra	$990.15	$1,508.85	$1,187.65	$1,602.10	$1,413.10	$11,814.60
Arlington	4,476.25	4,619.75	3,281.10	2,770.50	1,629.55	29,357.05
Buckstaff	3,400.43	4,967.55	3,174.70	3,027.90	2,689.65	28,886.38
Eastman	3,992.80	4,634.30	558.10	.....	.....	10,090.20
Fordyce	6,537.50	3,791.41	6,937.33	3,648.88	3,723.58	42,626.19
Hale	2,318.85	2,945.50	2,275.35	2,050.30	1,956.00	20,701.75
Imperial	2,521.10	3,367.50	1,945.45	2,448.15	1,891.95	22,225.55
Lamar	1,520.60	2,072.90	1,687.70	1,674.50	1,515.65	15,816.70
Magnesia	1,358.35	1,290.50	1,339.00	1,246.75	1,025.45	13,076.55
Majestic	2,736.40	2,795.90	2,039.00	1,447.60	1,442.55	18,813.75
Maurice	6,760.20	7,704.35	3,556.20	3,636.50	3,334.65	42,612.95
Moody	1,549.22	1,767.84	708.74	771.58	890.36	9,588.80
Ozark	2,913.80	2,177.30	2,277.15	2,005.55	1,944.80	20,540.15
Ozark Sanitorium	557.85	847.15	640.50	628.65	849.75	6,038.50
Pythian (col)	992.75	1,446.15	1,166.90	690.10	749.55	8,745.01
Rector	690.15	759.95	455.40	284.65	419.65	5,578.55
Rockafellow	1,613.77	2,522.60	1,579.15	1,526.30	1,400.55	14,936.02
Superior	2,489.25	3,055.45	2,287.60	2,413.85	1,851.25	21,539.60
St. Josephs Infirmary	717.07	494.07	389.50	362.80	314.07	3,986.16
Total	47,237.49	52,548.02	37,486.52	32,396.86	28,941.11	346,974.46

Business of the bathhouses for the fiscal year ended June 30, 1919.

Bathhouse.	Whole tickets.	Half tickets.	Quarter tickets.	Single tickets.	Total baths sold.	Baths redeemed.	Net paid baths.
Alhambra	1,378	728	123	1,386	38,219	3,283	34,936
Arlington	1,526	1,823	.....	4,328	54,604	8,972	45,632
Buckstaff	1,754	1,302	760	3,287	56,941	6,851	50,090
Eastman	566	948	.....	1,301	22,667	2,928	19,739
Fordyce	2,577	1,290	717	3,901	74,503	10,898	63,605
Hale	1,731	1,332	.....	2,575	52,246	5,775	46,471
Imperial	1,847	889	668	1,458	52,475	7,178	45,297
Lamar	1,230	1,206	691	1,833	43,178	4,816	38,362
Magnesia	1,639	858	195	1,813	45,787	7,769	38,018
Majestic	1,663	1,113	.....	1,424	47,477	9,298	38,179
Maurice	2,950	1,540	811	2,576	83,981	10,254	73,727
Moody	766	702	.....	1,301	24,407	3,110	21,297
Ozark	2,368	1,594	820	2,963	72,731	12,100	60,631
Ozark Sanitorium	606	429	.....	818	17,834	2,164	15,670
Pythian (colored)	854	840	301	1,692	29,531	2,101	27,430
Rector	653	263	152	687	17,790	3,306	14,484
Rockafellow	1,366	1,030	.....	1,370	40,356	2,800	37,556
Superior	1,953	1,057	648	1,361	56,184	6,517	49,667
St. Joseph's Infirmary	398	180	.....	53	10,211	1,005	9,206
Total	27,825	19,124	5,886	36,127	841,122	111,125	729,997

Bathhouse.	Complimentary baths.	Paid for redeemed baths.	Total bath receipts less redemptions.	Receipts from massage, etc.	Total receipts.	Total expenditures.	Net profits.
Alhambra	21	$1,149.05	$11,814.60	.....	$11,814.60	$8,466.65	$3,347.95
Arlington	131	5,106.15	26,957.05	$2,400.00	29,357.05	12,450.00	16,907.05
Buckstaff	295	3,768.05	26,749.15	2,137.23	28,886.38	20,809.25	8,077.13
Eastman	.....	1,425.35	9,690.20	400.00	10,090.20	6,030.00	4,060.20
Fordyce	461	7,084.89	36,265.76	6,360.43	42,626.19	25,089.41	17,536.78
Hale	10	2,598.75	20,261.75	440.00	20,701.75	14,525.18	6,176.57
Imperial	231	3,689.00	21,697.90	527.65	22,225.55	14,641.89	7,583.66
Lamar	42	1,926.50	14,944.35	872.35	15,816.70	9,196.81	6,619.89
Magnesia	127	2,719.35	12,823.10	253.45	13,076.55	9,269.25	3,807.30
Majestic	19	4,464.45	18,513.75	300.00	18,813.75	13,417.27	5,396.48
Maurice	92	5,639.70	39,056.15	3,556.80	42,612.95	26,578.51	16,034.44
Moody	14	1,306.20	9,397.30	191.50	9,588.80	5,554.03	4,034.77
Ozark	349	4,235.05	20,540.15	.....	20,540.15	9,888.70	10,651.45
Ozark Sanitorium	.....	865.60	6,038.50	.....	6,038.50	4,611.04	1,427.46
Pythian (colored)	.....	639.39	7,084.51	1,660.50	8,745.01	5,734.01	3,011.00
Rector	52	1,322.60	5,566.55	12.00	5,578.55	5,015.58	562.97
Rockafellow	.....	1,270.05	14,394.45	541.57	14,936.02	11,472.00	3,464.02
Superior	.....	2,932.65	21,539.35	.25	21,539.60	14,262.54	7,277.06
St. Joseph's Infirmary	.....	432.34	3,986.16	.....	3,986.16	2,486.70	1,499.46
Total	1,844	52,666.12	327,320.73	19,653.73	346,974.46	219,498.82	127,475.64

Fees received by bath attendants in the bathhouses for the fiscal year ended June 30, 1919.

Bathhouse.	Gross amount.	Redemptions.	Net amount.
Alhambra	$6,956.40	$609.30	$6,347.10
Arlington	10,240.40	1,468.20	8,772.20
Buckstaff	10,458.75	1,254.95	9,203.80
Eastman	4,420.20	585.50	3,834.70
Fordyce	13,868.30	2,688.66	11,179.64
Hale	9,557.35	1,074.85	8,482.50
Imperial	9,554.00	1,351.30	8,202.70
Lamar	8,087.00	893.35	7,193.65
Magnesia	8,182.55	1,421.80	6,760.75
Majestic	8,618.70	1,640.00	6,978.70
Maurice	15,457.50	1,951.30	13,506.20
Moody	4,491.95	598.25	3,893.70
Ozark	13,095.25	2,247.20	10,848.05
Ozark Sanitorium	2,236.10	399.20	1,836.90
Pythian (colored)	5,317.00	630.39	4,686.61
Rector	3,191.15	618.90	2,572.25
Rockafellow	7,798.00	423.35	7,374.65
Superior	10,197.60	1,192.30	9,005.30
St. Joseph's Infirmary	1,918.75	187.75	1,731.00
Total	153,646.95	21,236.55	132,410.40

RECOMMENDATIONS.

The past few years have demonstrated the necessity of the Government improving and beautifying the Hot Springs Reservation along permanent, substantial, and appropriate lines, the plans for which were prepared as a result of the appropriation of $10,000 from the revenues of the reservation contained in the sundry civil act approved June 12, 1917. These plans, which are now in Washington, have been made to include the numerous improvement schemes heretofore recommended by the superintendent, and have received the hearty approval of the National Park Service and the Secretary of the Interior. The recommendation of last year that all the improvements provided for in these plans be carried to completion is hereby renewed, and it is recommended that estimates be presented to Congress for an appropriation approximating $500,000 to continue such portions of the work as may be determined to be most important, and which has had its beginning by providing an appropriation of $190,000 for the construction of the administration building, free bathhouse, and clinic.

In the development of these plans this office has cooperated with the architects in order that they would be worked out in such manner as to attain the very best possible results. The most important of these improvements are enumerated as follows, together with the architects' estimate of cost at the time the plans were prepared, but which will, under present building conditions, exceed these estimates:

Summary of costs.

Strengthening impounding reservoir	$3,500
Two comfort stations on Bathhouse Row, at $13,534	27,068
Two comfort stations on each North, West, and Hot Springs Mountains and Whittington Lake Park, at $2,763	22,104
Main entrance and conservatory	169,500
Concert-garden scheme	212,635
Upper garden	122,926
Home for indigents	160,000
Whittington Lake Park	207,021
Major Hallock spring	2,600
Two gateways near Government building	2,400
Secondary entrance	4,500
New gorge road and bridges	212,500
Widening and surfacing mountain roads	90,000
Surfacing connecting roads	17,200
Sanitary sewers without purification plant	28,250
Drainage system as originally suggested in J. W. Barnett's report	458,500
Street improvement	36,400
New impounding reservoir	40,000
Cleansing system for reservoirs	14,750
	1,821,854

If bridges 12 feet wide are used on the Gorge road instead of 20 feet, deduct $17,000.

If penetration method asphalt macadam roadway surface is used instead of sheet asphalt for the Gorge road, deduct $21,000.

If 2,500,000-gallon capacity purification plant is included, with sanitary sewer system, add $98,000.

If a Nuhoff tank, as described in Mr. Barnett's report, is used with the sanitary sewer system, add $30,000.

If storm sewer system is built with reduced-size tunnel, as outlined in Ford & McCrea's report, deduct $133,500.

If storm sewer system is built with relief sewer instead of tunnel, deduct $257,500.

If tunnel is used for storm sewer system and concrete lining is omitted, deduct $50,000.

Referring to the recommendation contained in my annual report last year relative to means of securing a substantial increase in the revenues of the reservation and the plan to accomplish this result by the adoption of a new rule, a draft of which has been heretofore submitted to the Service for consideration; and to Service letter of December 21, 1918, which stated that the Service was not able to recommend the adoption of this rule under existing laws, also expressing its appreciation of the inequity by which no return is made to the Government by the class which derives material benefit through the agencies of the hot water, I recommend that the necessary steps be taken to secure the necessary legislation to accomplish this purpose as soon as practicable. It may be best to prepare an amendment to the act of April 20, 1904, to cover the deficiencies in the law, as set forth in your letter, including a clause whereby the revenues derived therefrom be merged with the revenues collected from hot water and ground rent, to be expended in the same manner on the Hot Springs Reservation.

In this connection, under authority of an act of the State legislature giving this authority to all cities of the first class within the State, the city of Hot Springs is putting into effect an occupation and privilege tax which becomes effective from and after October 1, 1919.

CONCLUSION.

If there have heretofore existed to the slightest degree any pessimistic views as to the future of Hot Springs as the world's greatest health-pleasure resort, they must certainly have been fully dispelled during the past few years. Year after year substantial gains in patronage are shown, and visitors departing sound the praises of Hot Springs, which condition has resulted from the strenuous work that has been done toward eliminating the drumming evil until it is almost extinct.

The system of exploiting all the national parks by means of descriptive literature sent broadcast throughout the country has resulted in materially increasing the patronage here.

The next few years will undoubtedly mark the accomplishment of all the improvements and beautification of the reservation heretofore proposed by this Service, which begins with the construction of the new administration building, free bathhouse, and clinic. When all these improvements shall have been completed and taken in connection with the natural scenic beauty with which the resort is surrounded, it will be the pride of all the Nation, as it will have no equal as a health-pleasure resort.

My prediction of last year that additional modern, commodious, and attractive hotel facilities would be necessary to care for the increased patronage has been fully confirmed, and it is hoped this urgent need will be supplied in the near future.

YELLOWSTONE NATIONAL PARK.

HORACE M. ALBRIGHT, superintendent Yellowstone Park, Wyo.

GENERAL STATEMENT.

The Yellowstone National Park was reserved from the public domain by act of Congress approved March 1, 1872,[1] and dedicated as a "pleasuring ground for the benefit and enjoyment of the people." When established the park was situated in a vast region which had been divided into a few territories, and practically all of which was embraced within the great Louisiana Purchase area. When these Territories were finally changed to States and the surveys were made of these new Commonwealths it was found that while the park was principally in Wyoming, it extended more than 2 miles into Montana on the north and almost 2 miles into Montana and Idaho on the west.

The park is rectangular in shape, with east and west sides about 62 miles in length and north and south boundaries 54 miles long. The total area of the park is 3,348 square miles, or 2,142,720 acres, of which 3,114 square miles, or 1,992,960 acres, are in the State of Wyoming, 198 square miles, or 126,720 acres, are in the State of Montana, and 36 square miles, or 23,040 acres, are in the State of Idaho. It is the biggest park in the United States and next to the largest park in the world, being exceeded in area only by Jasper National Park, of the Dominion of Canada.

The altitude of the park is 6,000 to 11,000 feet.

The boundaries of the park have never been changed since they were first established in 1872. However, it is proposed now to extend the park lines to include the Teton Mountains, the headwaters of the Yellowstone River, the valley of Pacific Creek, and the country north of the Buffalo Fork of the Snake, taking in an area of approximately 1,265 square miles, most of which now lies in a forest reserve and two State game preserves. All of this land was withdrawn from settlement on July 8, 1918, in aid of pending legislation.

ADMINISTRATION OF THE PARK.

For 14 years after its establishment Yellowstone National Park was administered by civilian superintendents appointed by the Secretary of the Interior. With the exception of the first superintendent, N. P. Langford, one of the explorers of the park, who served five years without salary or any other emoluments and without assistance, these officers were aided by a few scouts.

In the early eighties some very unsatisfactory conditions connected with the administration of the park were aired in Congress, and the result of these findings was the enactment of a law approved March 3, 1883, authorizing the Secretary of the Interior to call upon the Secretary of War for details of troops to guard the park. Nevertheless, as long as funds were available to manage the park the Interior Department did not call for soldiers. At length Congress refused to appropriate any funds for the protection of the park, and on August 20, 1886, the civilian force was finally removed and a detachment of troops assumed control of the park, Capt. Moses Harris becoming the first military acting superintendent.

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[1] Secs. 2474 and 2475, R. S. (17 Stat., 32).

It was 32 years later, on October 31, 1918, when complete civilian control of the park was finally restored. Meanwhile Fort Yellowstone, capable of accommodating four troops of Cavalry, was built and used by the military force, but rarely ever to its full capacity. The fort was abandoned with the withdrawal of the troops last year.

During the military rule in the park not less than a dozen officers of the United States Cavalry were in charge as acting superintendent, several of them making enviable records. Three of them were in charge for periods of six years each. One of them served two terms in this office, about 10 years apart.

PROTECTION OF THE PARK.

The protection of Yellowstone Park is now under the direct control of the superintendent, who exercises his authority through a very efficient ranger force, composed of an acting chief park ranger, 3 assistant chief park rangers, and 25 park rangers. This is the existing force, but the authorized force includes a chief park ranger and four assistant chief park rangers. During the tourist season a temporary force of from 25 to 30 park rangers is employed to check automobiles at the various gateways, to control traffic on the highways, to protect the geyser, hot spring, and other formations, and to fight fires, or to perform any other service required.

The ranger force is uniformed during the tourist season and presents a very striking appearance. In the fall, winter, and spring these men patrol the trails in plain clothes, and are very effective in protecting the park from poachers and other trespassers.

I am particularly proud of the present ranger force and its achievements of the past season, when the demands upon it were tremendous. It has demonstrated beyond peradventure of a doubt that it is far more capable of protecting this great reservation than were the military forces. These park rangers have the interest of the park at heart; they love its wild life, its forests, its lakes and streams, and they are ready to protect these features regardless of the conditions under which this must be done. They come closely in contact with the tourists in the summer season, and their courteous treatment of these visitors this year has prompted many words of commendation of the force, even by people who have been arrested by them for violation of the rules and regulations.

On the other hand, the soldiers were here to-day and gone to-morrow. Some took the same deep interest in the park that the park rangers do, but in most cases they were care free and unconcerned with the problems of protecting the reservation. It was always necessary, even when the military forces were here, to employ a group of civilian scouts who knew the park to care for the wild animals and to guide new troops to their outposts, the latter, unfortunately, an all too frequent duty.

ENGINEERING WORK IN THE PARK.

Since July 1, 1918, the superintendent has been vested with full powers of supervision of the improvement and maintenance of roads, trails, buildings, and all other engineering work, much of which was formerly exercised by a district engineer officer of the Corps of Engineers of the United States Army. In other words, control of the administration, protection, maintenance, and improvement of the park is now exercised by the superintendent for the first time since the early eighties. This centralization of authority in one head, with one office, has resulted in effecting several important economies, and has made it possible to correlate the various activities of the park in a peculiarly satisfactory and effective manner. The new organization is not entirely complete, and another year may elapse before everything is running with desired smoothness, but perfectly balanced operations are on the way.

HEADQUARTERS.

Park headquarters are located at Mammoth Hot Springs, 5 miles from the northern entrance. Fifteen ranger stations are maintained at convenient points throughout the park, and these are connected with headquarters by 269 miles of telephone lines.

The abandoned Fort Yellowstone buildings are now the headquarters structures. In one of these buildings the park office is maintained, but early next year we hope to remodel the bachelor officers' quarters in the old fort for use as an administration building and museum. A museum here is a most needed institution in connection with the educational work of the Service, and should be established very soon. Likewise the new administrative building will have a large and fully equipped information office, with a sufficient supply of publications on the entire park system to meet all tourist inquiries.

Park Ranger M. P. Skinner is now engaged in collecting specimens of geyser and hot-spring formations, mammals, birds, wild flowers, etc., for the museum exhibits.

A member of the ranger force is a deputy United States marshal for Wyoming, and most of the park rangers are deputy State game wardens of Wyoming, Montana, and Idaho.

JURISDICTION OF OFFENSES.

Exclusive jurisdiction of felonies and misdemeanors, including violations of the rules and regulations, committed in Yellowstone Park is vested in the Federal Government. A resident United States commissioner has authority in cases of misdemeanor or violations of the regulations to impose fines up to $500, to sentence offenders to imprisonment of not exceeding six months, or to impose penalties of both fine and imprisonment. In felony cases the commissioner has power to determine probable cause for holding a suspect, and he may hold him for trial by the United States District Court for Wyoming. Whenever a felony or misdemeanor not covered by the laws of the United States is committed in the park the laws of the State of Wyoming will govern the action of the court or court commissioner, as the case may be.

Hon. John W. Meldrum has been United States commissioner for the park since 1894, when the jurisdiction act of May 7, 1894, went into effect.

WEATHER BUREAU.

Reports of temperature, precipitation, wind, sunshine, etc., have been furnished by the branch office of the United States Weather Bureau, which is maintained at Mammoth Hot Springs. Such observations as are made here were supplemented by temperature and precipitation records made by the rangers at Norris, Riverside, Gallatin, Snake River, Lake, and Soda Butte ranger stations. The office was in charge of Mr. George E. Lawton, observer, until October 5, when he was relieved by Mr. Edgar Fletcher.

The winter of 1918–19 was one of the most remarkable for mildness of weather on record. This is shown not only by weather reports of temperature, precipitation, etc., but by the fact that the winter was so open that it was not necessary to feed hay at any time to the wild animals. Trucks were able to travel the road between headquarters and Tower Falls all winter. Teams came in from the west entrance on January 15 without shoveling snow; the trucks went to Canyon as early as May 19, both of which are very unusual.

RAILROADS AND HIGHWAYS TO PARK ENTRANCES.

There are four principal gateways to Yellowstone National Park, and three are accessible by both train and automobile. The fourth has no train service.

Northern gateway.—The northern or Gardiner gateway is reached via a Northern Pacific Railway branch line from Livingston, Mont. The Northern Pacific operated two trains a day over this branch during the season. Through Pullman service to and from both eastern and western points to the north gateway was maintained. The town of Gardiner is situated on the park line, and is 53 miles from Livingston.

An automobile highway follows the railroad. This road is a part of the Yellowstone Trail and the National Parks Highway, two great transcontinental routes. It is also a part of the three main routes to Glacier National Park, the Yellowstone-Glacier Bee-Line Highway via Livingston, White Sulphur Springs, and Great Falls; the Geysers-to-Glaciers Highway via Livingston, Bozeman, and Helena; and the Flathead Valley route via Livingston, Butte, and Missoula. This northern approach road was in good repair most of the summer and part of it is now being rebuilt under funds provided by Park County and the National Government under the Federal aid road act.

Eastern gateway.—The eastern or Cody gateway is reached by automobile service over an excellent highway maintained by the State and the National Park Service from the town of Cody, 55 miles from the park boundary. The railroad service to Cody is maintained by the Chicago, Burlington & Quincy Railroad, which operated two trains a day during the past season, making connections at Billings with trains of the Northern Pacific and Great Northern routes and at Billings and Frannie with its own trains for the East and Denver, respectively. Through Pullman service was maintained, which made travel to Cody particularly comfortable and convenient.

The automobile road between Cody and the Shoshone National Forest boundary, a distance of 27 miles, was maintained by Park County, Wyo., and citizens of Cody until July 1, 1919, when the duty of maintaining this section was taken over by the State highway commission. The road through the Shoshone National Forest, a distance of 28 miles, was maintained by the National Park Service in accordance with the provisions of the sundry civil appropriation act. This entire highway is a part of the Yellowstone Highway, which traverses Wyoming from Cheyenne to Cody and the park by way of Douglas, Casper, and Thermopolis. It is also on the Black and Yellow Trail, a transcontinental route that is being greatly improved and vigorously promoted at the present time. The Black and Yellow Trail crosses the Bighorn Mountains by way of the beautiful Ten Sleep Canyon.

The Cody approach road has never been in better condition than it was during the past season, and, considering the exceedingly dry summer, the roads across the State of Wyoming were in very fair condition.

In late July, accompanied by officers of the Glacier and Yellowstone Park transportation companies and other parties interested in the development of interpark travel, I made a trip from the park headquarters to Denver, a distance of 809 miles, in 30 hours and 45 minutes.

Western gateway.—The western or Yellowstone gateway is reached by the Yellowstone Park branch of the Oregon Short Line Railway, which operated nightly during the past season an all-Pullman train, known as the Yellowstone Special. This train left Salt Lake in the early evening and arrived at the western gateway at 8 a. m. the next day.

Automobile roads lead to this gateway from Utah and Idaho points and sections of the Montana State highway system approach this entrance by way of the Ruby Valley and Virginia City, the Madison River Valley, and the Gallatin Valley. With the exception of the road following the direct route from Ashton, Idaho, to Yellowstone, Mont., most of these highways were in good condition for automobile travel during the past summer. The road between Ashton and the park entrance, however, was in an extremely bad condition, and as a result many motorists made long detours in order to avoid this road. Plans are now under way to improve this bad approach road before the opening of next season.

Southern gateway.—The southern or Snake River entrance at the present time has no train service. Automobile roads lead to this entrance from Riverton and Lander, Wyo., by way of the Wind River and Twogwotee Pass; from Rock Springs and Pinedale, Wyo., by way of the Hoback River and the Jackson Hole; from the Teton Valley, Idaho, via Victor, Idaho, the terminus of the Teton Valley branch of the Oregon Short Line, and Teton Pass; and from Ashton, Idaho, by way of Squirrel Meadows and the head of Jackson Lake, a road that is now in a state of disrepair.

The Teton Pass road has been in excellent condition for travel throughout the summer. The Wind River and Hoback River routes have been passable for automobiles, but have not been very satisfactory for travel, due to the great amount of reconstruction work that has been carried on. It is expected that both of these routes will be in a much better condition for travel next year. Both of them are being rebuilt under cooperative agreements between the State of Wyoming and the Federal Government, under the Federal-aid road act, the Forest Service also supplying funds from its highway appropriations.

There are two other entrances which are becoming increasing important.

Northwestern gateway.—The northwestern or Gallatin entrance is reached by a road which leads from the thriving city of Bozeman through the superbly colored and beautifully carved gorge of the Gallatin River. This road is now being rebuilt with State, county, and Federal-aid funds, and when completed will doubtless become one of the most popular approaches to the park.

Northeastern Gateway.—The northeastern or Cooke City entrance will be reached by a road which is being constructed from Red Lodge and Bearcreek, Mont. This new road will traverse the Beartooth Mountain Range, and will be a very scenic approach. I have no information as to when this road will probably be completed, but in all likelihood it will be several years before it reaches the park boundary. In the meantime the Cooke City region is accessible from the northern entrance by way of the Lamar River Canyon and the canyon of Soda Butte Creek, on the park highway system.

ROAD SYSTEM.

There are 278.8 miles comprising the main highway system of the park and there are 24.75 miles of secondary road within its boundaries. These roads, with the distance between junction points, are shown clearly on the attached map.

In the Shoshone National Forest, east of the park, we are charged with maintaining 28 miles of the main Cody approach road, and in that part of the Teton National Forest which is comprehended in the plan to extend the park boundaries we are required by law to maintain approximately 30 miles of the main highway leading to the southern entrance of the park. Should the park be enlarged, this obligation will extend to the upkeep of considerable additional mileage along the north side of the Buffalo Fork of the Snake River and the larger part of the road from Ashton, Idaho, toward the present southern entrance.

The work that was performed on all of the roads under our control is outlined in another portion of this report.

TRAIL SYSTEM.

There are between 400 and 500 miles of trails in the park, over 400 of which are fairly well marked and over 300 miles of which are particularly good tourist trails. All of the trails are used by the rangers for fire patrols.

The work accomplished in preparing this trail system is discussed in another part of this report, as are also the extensions of the trail system that ought to be undertaken in the early future.

TRAVEL OF THE 1919 SEASON.

All travel records of Yellowstone National Park were broken during the 1919 season. Never in the history of the park have so many people enjoyed its opportunities for recreation and sight-seeing as came here for that purpose this year. Furthermore, the tourists this season saw more of the park than usual; there was a general tendency to cover all of the main roads and make as many side trips as possible.

The spring conditions for travel were good. Snow left the roads earlier than usual, and on the opening day of the season, June 20, the main belt line and all of the entrance roads were open to public use. The first day of the season saw the hotels and permanent camps filled to their capacity, and this condition continued until practically the close of the season on September 20.

On August 5, 1919, 1,255 tourists entered the park, the greatest number entering in any on day in the history of the Yellowstone. The greatest number of private automobiles entering in one day was 202, on August 4, 1919.

It is with a feeling of pride and happiness that I call attention to the increase in the use of the trails of the park during the year. The people who toured the park with pack trains all expressed themselves as highly pleased with their trips. They all had wonderful opportunities to see the wild animals under the best conditions, and, of course, they enjoyed thrilling rides through scenic regions that are hardly surpassed in any national park. Most of the trail parties also covered the proposed extension south of the park, including the Teton Mountains.

The aggregate number of persons visiting the park during the year ended October 12, 1919, was 62,261. The following tables show some very interesting analyses of this travel figure:

Travel by different entrances.

From the north, via Gardiner, Mont	22,786
From the west, via Yellowstone, Mont	23,558
From the east, via Cody, Wyo	13,455
From the south, via Moran, Wyo	2,462
Total	62,261

Yellowstone Park Transportation Co.

Entering via the northern entrance	9,353	
Entering via the western entrance	8,897	
Entering via the eastern entrance	3,025	
		21,275

Making trips with private transportation.

With automobiles, paid and complimentary	37,724	
With automobiles, second trip	2,162	
		39,886
With motor cycles	56	
With licensed saddle and pack trains	129	
With miscellaneous facilities, including out-of-season visitors to the park	915	
		1,100
Grand total		62,261

GARDINER (NORTH ENTRANCE) R R Sta - P O - Express Hotels - Store - Garage
MAMMOTH HOTEL
Yellowstone Park P O Express - Store - Garage
SUPT'S OFFICE
FREE PUBLIC AUTO CAMP AND SHELTER
Mammoth Hot Springs
GOLDEN GATE ROAD
Golden Gate
Gray Pk 10 300
Bunsen Pk (9100)
MAMMOTH CAMP Gasoline - Oils
SEVENMILE BRIDGE
Three Rivers Pk 9900
White Pks 9600
Obsidian Cliff
Roaring Mtn 8600
Folsom Pk 9200
Lava Cr
Tower Cr
Petrified Trees
Tower Falls (132 FOOT DROP)
TOWER FALLS CAMP Gasoline - Oils
TOWER FALLS ROAD
Tower Falls
Slough Cr
Bison Pk 8800
Buffalo Farm
Lamar
Soda Butte
Fossil Forest
Amethyst Mtn 9400
Wahb Springs
Cache
Pebble Cr
Soda Butte Cr
THE THUNDERER
9600 The Needles
Deep Creek
MIRROR PLATEAU
Miller Cr
Mt Washburn 10 000
Haynes Picture Shop
GRAND CANYON
Dunraven Pass
CANYON HOTEL Garage
CANYON CAMP Gasoline - Oils
CHITTENDEN BRIDGE
Inspiration Pt
Artist Pt
Canyon
Store
NORRIS GEYSER BASIN
Norris
12 M
CANYON ROAD
YELLOWSTONE RIVER
Saddle Mtn 10 000
FREE PUBLIC AUTO CAMP AND SHELTER
Virginia Cascades
Gibbon Canyon
Iron Spring
TERRACE ROAD
30 M
YELLOWSTONE (WEST ENTRANCE) R R Sta - P O Express Hotels - Store - Garage
BOUNDARY LINE
GALLATIN RIVER ROAD
Gallatin
Gallatin Riv
32 M
MADISON RIVER ROAD
Madison Riv
Riverside
Gibbon Falls (80 FOOT DROP)
Mud Geysers
9500 Pelican Cone
Alum Cr
PLATEAU
Cold
Pyramid Peak
Cathedral Pk 10 600
LAKE HOTEL Store Garage
FISHING BRIDGE
Turbid L
PAHASKA TEEPEE Hotel - Store - Garage
29M
CODY
TO CODY 55 MILES
Sylvan Lake
Sylvan Pass
Sylvan Pass
ROAD
Clear Cr
9700 Grizzly Pk
CODY OR EAST ENTRANCE
Stevenson I
Natural Bridge
LAKE ROAD
5 M
YELLOWSTONE LAKE
Dot I
Frank
Thumb
CONTINENTAL DIVIDE ROAD
19 M
Mt Langford 10 600
Brimstone Basin
The Promontory
Southeast Arm
Beaverdam Cr
Mt Shurz 10 900
Colter Pk 10 500
Table Mtn 10 800
Yellowstone River
THE TRIDENT
TWO OCEAN PLATEAU
Mountain Cr
Heart Lake Geyser Basin
Heart L
DIVIDE
Overlook Mtn 9400
RED MTNS
PITCHSTONE PLATEAU
SCALE
2 1 0 2 4 6 8 10 MILES
1919
Trails
Shelter Cabins
SOUTH ENTRANCE
Barlow Pk 9500
Mt Hancock 10 100
Snake River
TO MORAN 25 MILES
SNAKE RIVER ROAD
LEWIS RIVER
LEWIS LAKE RD
23M
Lewis L
Shoshone L
Shoshone Geyser Basin
Lone Star Geyser
UPPER GEYSER BASIN CAMP
FREE PUBLIC AUTO CAMP AND SHELTER
OLD FAITHFUL INN Store - Garage
Upper Basin
Old Faithful 6240
Kepler Cascade
UPPER GEYSER BASIN
CONTINENTAL DIVIDE
El 6345'
Firehole Lake
Firehole River
Firehole
LOWER GEYSER BASIN
FOUNTAIN FOUNTAIN ROAD
Cascades of the Firehole
20 M
MADISON PLATEAU
MONTANA WYOMING
IDAHO WYOMING
Boundary
Bechler River
Bechler Falls
Lilypad L
Beula L
Snake River
Yellowstone Lake
Yellowstone River
Mountain Cr
THE THUNDERER
Cache
Soda Butte Cr
Pebble Cr
Deep Creek
MIRROR PLATEAU
Miller Cr
Cold
Alum Cr
Clear Cr
Beaverdam Cr
Boundary
Bechler River
Mountain Cr
Yellowstone River
THE TRIDENT
TWO OCEAN PLATEAU
Heart L
Lewis L
Shoshone L
Lilypad L
Beula L
Bechler River
Snake River
Yellowstone Lake
Yellowstone River
Mountain Cr

Private automobile travel.

	Automobiles.	Tourists.
Entering via the northern entrance	3,478	12,621
Entering via the western entrance	3,783	14,520
Entering via the eastern entrance	2,853	10,330
Entering via the southern entrance	623	2,415
Total	10,737	39,886

Motor cycle travel.

	Motor cycles.	Tourists.
Entering via the northern entrance	20	31
Entering via the western entrance	9	14
Entering via the eastern entrance	7	11
Total	36	56

The following tables are given for the purpose of comparing the travel of this season with the number of visitors entering the park in 1918, the war season; 1917, the season of average travel since the admission of automobiles to the park; and 1915, the Panama-Pacific Exposition season. These tables give in the first column the number of automobiles and in the case of the 1918 and 1919 statistics the number of motor cycles entering the park; in the second column the number of visitors to the park is shown by reference to entrances, those entering via Soda Butte ranger station, or the northeast gateway, being listed with the eastern-entrance visitors; the next column shows the number of visitors reaching the north, west, and east entrances by rail; and the last column gives the total number of visitors by entrances.

Entrance.	Private transportation.		By rail.	Total visitors.
	Cars.	Visitors.		
1919.				
North	3,498	13,433	9,353	22,786
West	3,792	14,661	8,897	23,558
East	2,860	10,430	3,025	13,455
South	623	2,462	.....	2,462
Total	[1] 10,773	40,986	21,275	62,261
1918.				
North	1,528	6,027	1,537	7,564
West	1,943	7,566	1,136	8,702
East	1,128	[2] 4,114	353	4,467
South	135	542	.....	542
Total	[3] 4,734	18,249	3,026	21,275
1917.				
North	1,994	7,645	5,774	13,419
West	2,258	9,055	5,635	14,690
East	1,353	[4] 5,061	1,874	6,935
South	98	356	.....	356
Total	5,703	22,117	13,283	35,400
1915.				
North	365	3,094	14,369	17,463
West	392	2,795	29,756	32,551
East	193	1,198	352	1,550
South	8	331	.....	331
Total	958	7,418	44,477	51,895

[1] Includes 36 motorcycles carrying 56 passengers.
[2] Includes 66 people entering via the northeastern gateway.
[3] Includes 16 motorcycles carrying 25 passengers.
[4] Includes 104 people entering via the northeastern gateway.

Statement showing automobile travel, by States, season of 1919.

Name of State.	North.		West.		East.		South.		Total.	
	Cars.	Passengers.	Cars.	Passengers.	Cars.	Passengers.	Cars.	Passengers.	Cars.	Passengers.
Alabama					1	2			1	2
Arkansas	1	4	4	10	19	73	1	2	25	89
Arizona	3	6	12	58	9	13	11	49	35	126
Colorado	24	91	54	189	258	866	6	20	342	1,166
California	105	322	204	714	69	202	9	27	387	1,265
Connecticut	2	7	3	12	6	17			11	36
Delaware	1	3	1	2	1	5			3	10
Florida	5	16	2	7	3	14			10	37
Georgia	2	5	4	14	2	10			8	29
Illinois	67	228	12	38	77	313	5	18	161	597
Indiana	22	81	9	33	31	98			62	212
Iowa	93	353	6	54	160	591	3	8	262	916
Idaho	44	108	1,066	4,205	13	47	232	959	1,355	5,319
Kansas	17	66	25	132	176	591	8	29	226	818
Kentucky	1	5			3	10			4	15
Louisiana	2	7	5	14	10	46			17	67
Montana	1,705	6,412	860	3,021	289	962	5	22	2,859	10,417
Maryland	3	9	1	4	1	7			5	20
Massachusetts	4	14	4	15	11	31	1	2	20	62
Maine	1	2	11	36	1	6			13	44
Michigan	38	148	3	10	42	153	5	17	88	328
Mississippi	11	41							11	41
Missouri	16	61	30	104	96	381	3	13	145	559
Minnesota	109	382	8	18	32	120			149	520
New York	30	91	6	30	36	123	1	4	73	248
New Mexico	2	4	4	14	11	47			17	65
New Jersey	3	11	3	13	4	18	1	5	11	47
New Hampshire	1	2	1	2	1	2	1	2	4	8
Nevada	1	4	18	52			1	6	20	62
Nebraska	47	174	34	126	263	930	12	47	356	1,337
North Dakota	125	513	7	26	29	120	2	9	163	668
Oklahoma	78	296	24	114	80	376	3	8	185	794
Ohio	38	115	16	56	53	149	3	9	110	319
Oregon	88	343	140	518	15	40	3	12	246	913
Pennsylvania	19	51	5	16	23	84	1	4	48	155
Rhode Island	2	5							2	5
South Dakota	101	328	7	20	76	255	1	2	185	605
Texas	7	19	20	57	77	265	1	6	105	347
Tennessee	1	4	2	8	7	22	2	9	12	43
Utah	16	59	669	2,856	11	43	117	480	804	3,438
Virginia	4	8							4	8
Vermont	1	3	1	4	1	5			3	12
Washington	260	862	175	675	58	216	3	9	496	1,762
Wisconsin	79	287	8	33	32	116	1	2	120	438
Wyoming	48	172	42	139	693	2,739	95	337	878	3,387
West Virginia					4	12			4	12
District Columbia	2	3	2	5					4	8
Canada	44	169	26	113	8	22			78	304
Canal Zone					1	2			1	2
Denmark							1	2	1	2
Total	3,273	11,894	3,525	13,567	2,793	10,104	538	2,119	10,129	37,684
Complimentary cars, unclassified by States									17	
Motorists entering in complimentary cars, unclassified by States										49
Second entry cars, unclassified by States									591	
Motorists entering in second entry cars, unclassified by States										2,162
Grand total, all cars and motorists, classified and unclassified									10,737	39,886

AUTOMOBILE AND MOTOR-CYCLE FEES.

A fee of $7.50 was charged for automobile tickets of passage and $2.50 for motor-cycle tickets of passage, which were good for the entire season. Complimentary tickets were issued to officials of adjoining States or counties and to officers of the Federal Government visiting the park officially.

ACCOMMODATIONS.

The above tables disclose the most interesting fact that of the grand total of 62,261 visitors to the park approximately two-thirds came here in their private automobiles. Of these probably 60 per cent brought with them their own camp equipment, and in most cases used and appreciated our special camp grounds, where wood, water, toilet facilities, and, at Mammoth Hot Springs, electric lights were furnished without charge.

At times during the summer these camp grounds were overcrowded, and before the opening of next season they must be expanded and new areas opened for this use. Likewise, more wood must be provided, and a considerable sum of money must be expended

in improving the water and sanitation facilities. The popularity of these camps fully warrants their development on a large scale.

Of the 18,679 tourists who came to the park by rail and utilized the facilities of the Yellowstone Park Transportation Co., making the complete park tour, 10,442 were accommodated at the hotels and 8,237 at the permanent camps. I have no data as to the accommodations furnished to people who made short trips in the park or toured only a part of the reservation with the Yellowstone Park Transportation Co. This group of visitors numbered 2,596. Likewise we have not been able to compile statistics of the number of private motorists who secured accommodations at the hotels and permanent camps, but, as I have stated, it is estimated that about 60 per cent of these visitors brought their own camp equipment with them. This is a conservative estimate, hence not more than fifteen or sixteen thousand individual automobilists purchased meals or lodgings or both at the hotels and camps.

The total meals and lodgings furnished at the hotels and camps during the season were as follows:

	Meals.	Lodgings.	Total.
Hotels:			
Mammoth Hotel	54,210	17,797	72,007
Old Faithful Inn	61,218	18,630	79,848
Canyon Hotel	81,898	29,596	111,494
Totals	197,326	66,023	263,349
Permanent camps:			
Mammoth Camp	39,718	14,481	54,199
Geysers Camp	48,816	16,251	65,067
Canyon Camp	60,479	17,115	77,594
Lake (emergency camp only)	1,735	1,376	3,111
Camp Roosevelt (Tower Falls)	4,091	1,615	5,706
Totals	154,839	50,838	205,677

SERVICE TO THE PUBLIC.

At times during the season the hotels and camps were filled to overflowing, and there were occasions when people had to be turned away from the establishments at the Grand Canyon of the Yellowstone, despite the fact that both the hotel and camp at this point are much larger than the plants at Mammoth Hot Springs, Upper Geyser Basin, and Lake Yellowstone. This was due to congestion at the canyon owing to lack of accommodations at the lake. Nevertheless, remarkably good service was furnished to the public by both the hotel and camp companies, and few complaints regarding unsatisfactory treatment at the hands of these companies have been made to my office or to the Service, so far as I have been advised.

That service should have been so uniformly satisfactory is especially worthy of note, because both the hotels and camps had great difficulty in securing and keeping sufficient competent help to operate their several plants. Time and again during the summer they were almost brought to the point of closing the doors of one or more resorts, due to lack of enough assistance to keep them in operation. Laundry help was particularly hard to secure.

LAKE HOTEL AND PERMANENT CAMP.

This discussion leads naturally to the situation at Lake Yellowstone, where the hotel and permanent camp were both closed during the season. In the first place, they were not in proper condition to open. Many necessary repairs had to be made to the hotel, and the permanent camp was in reality out of existence. The latter was torn down in the autumn of 1917 in preparation for the building of a complete new plant. A new central structure was begun, but snow caused the early cessation of work, and of course war conditions prevented rebuilding last year. It would have been impossible to have rebuilt the camp during the spring of 1919.

But quite aside from the physical difficulties in the way of opening the lake resorts, the labor situation was such that it would have been practically impossible to have secured crews for either place.

Work is in progress now on the rebuilding of the Lake Camp, and the hotel is undergoing extensive repairs, with a view to full operations next season. An exceedingly attractive log building of ample proportions is being constructed at the camp. This will be used as a dining room and lobby, and will be in most respects more interesting and attractive than any building in the park except Old Faithful Inn and the Canyon Hotel. A new kitchen, new comfort stations with flush toilets, and a general rearrangement of tents will constitute the bulk of the other improvements that will be made in this camp before next season.

At the Lake Hotel the improvements that will be the most noteworthy will include a porte-cochère in front of the central entrance of the hotel, built with faithful adherence to the colonial architecture of the hotel itself. The old porch floors will be replaced by concrete walks, and the grounds in front of the hotel will be improved by planting.

Taken in connection with the new store that will be built at the lake by C. A. Hamilton and the new filling station of the Yellowstone Park Transportation Co., the improvements at this point will go far toward making it the most popular tourist resort of the park. The establishment of a large, new public automobile camp is another project that we hope to complete next year at this point, and if authorized a new ranger station and information office will also be erected here.

SPECIAL CAMP SERVICE.

The Yellowstone Park Camping Co. operated its Camp Roosevelt near Lost Creek in the Tower Falls region during July and August and accommodated a considerable

number of people who sought service in that scenic section of the park. This camp is destined to be very popular as a fishing and riding resort. It is in the neighborhood of some of the best fishing waters of the park, and is a radiation point for numerous very interesting trails.

During the summer it likewise furnished emergency service to tourists at the temporary camp it maintained at Yellowstone Lake in connection with the construction of its new camp buildings.

TRANSPORTATION SERVICE.

The Yellowstone Park Transportation Co. maintained first-class service to and from all park gateways, connecting with regular trains at Cody, Wyo., and Gardiner and Yellowstone, Mont., and in addition operated cars regularly twice a week in both directions between Upper Geyser Basin and B. D. Sheffield's Teton Lodge, at Moran, near the upper part of the Jackson Hole. A total of 414 tourists availed themselves of this Jackson Hole trip, and apparently all came back enthusiastically in favor of placing the magnificent Teton Mountains in the park, as contemplated by pending legislation.

During the summer the transportation company had in service 100 ten-passanger automobiles and 17 seven-passenger touring cars, and with all of this equipment it was often necessary to operate them on double shifts in order to move all of the people who wanted to travel in the park. Arrangements are now being made to increase this equipment materially before the opening of next season.

Garage, gasoline, and oil, and repair service was maintained by this company at Mammoth Hot Springs, Upper Geyser Basin, Lake, and Grand Canyon.

Considerable trouble was experienced during the early part of the season in controlling the operation of the cars of the transportation line on the park highways. Many of the drivers of the cars were careless and irresponsible, and refused to observe the rules and regulations. These were dismissed or punished or had both penalties meted out to them as fast as they could be caught and brought to headquarters. Others persisted in the idea that they had the right of way on the roads and were constantly compelling private motorists to let them pass, even though they were not behind their schedule nor had other good reason for moving ahead. It took some weeks to get all of these drivers to understand that they had to submit to regulation, that they did not have the right of way, that they had to respect the rights of the private motorist, and that they had to exercise the utmost care of the lives and property in their hands. In extenuation of the offenses of some of these boys, it may be said that they had just been discharged from the aviation and motor-truck services of the Army and found driving passenger cars over the park roads too simple a task. Even when going at high speed they could not realize that there was any danger or that any passenger might feel timid.

INFORMATION SERVICE.

An information desk was maintained in the superintendent's office during the tourist season, and was visited by many tourists. Here were sold Geological Survey contour maps of the park and certain park pamphlets, and information circulars of the various national parks and other literature of value to the public were distributed free of charge. The Government information circular is a very popular pamphlet of inestimable value to travelers. It is in great demand, and its publication and free distribution should under all circumstances be continued. Automobile maps and circulars of information of other parks were also distributed in considerable quantities.

Automobile maps and information pamphlets relating to Yellowstone Park were also distributed by rangers at each entrance to the park, and a sticker with important regulations printed on it, together with a warning about forest fires printed in brilliant red ink, was pasted on the wind shields of all cars coming into the park.

At his Tower Falls photographic studio Mr. J. E. Haynes maintained a free information bureau for the benefit of the public.

MISCELLANEOUS SERVICE.

Mr. J. E. Haynes, official photographer, operated picture shops at Mammoth Hot Springs, Upper Geyser Basin, and Tower Falls, and also photograph stands in all hotels and camps. His film developing and printing department was heavily patronized by kodak users.

General stores were maintained at Upper Geyser Basin and at Lake Outlet by Mr. C. A. Hamilton, and similar establishments were maintained by Mr. George Whittaker at Mammoth Hot Springs and at Canyon. Mesdames Pryor and Trischman operated a curio store and ice-cream parlor at Mammoth Hot Springs.

At Upper Geyser Basin, Mr. Henry P. Brothers operated the Geyser Baths. He reports that 8,499 persons used these baths, of whom 1,547 were park employees.

All of these enterprises gave unusually satisfactory service to the public, and complaints of improper treatment of visitors were few.

ROAD PAVEMENT NEEDED.

The road system of the park was subjected to worse wear and tear this year than ever before. The lack of rain caused the roads to keep in a thoroughly dry condition, and with the sun constantly shining sprinkling on the sections of the highways that are subject to this treatment was not as effective as usual in holding down the dust. Furthermore, winds were frequent and in the course of the summer considerably impaired certain sections of the road by blowing off top surfacing material.

The tremendously heavy motor travel, of course, was the agency that impaired the road system most. As the statistics already quoted show, 10,737 private automobiles toured the park this season. Let us assume that the equivalent of 2,500 more cars were operated by the Yellowstone Park Transportation Co., making a total of 13,237 pleasure cars on the roads during the summer. Let us further make the conservative estimate that these cars traveled over 200 miles of the road system. Using these figures

to determine the use of the roads, we find that the total travel for the season was 2,647,400 motor miles. As there were 62,261 tourists in the park during the summer, the passenger miles traveled were 12,453,200—a stupendous travel for a road system that has practically no permanent or semipermanent surfacing of any kind. Some stretches of the road are graveled, and part of the west approach is surfaced with oil macadam, but these sections are such a small part of the whole that they might well be omitted from consideration.

As I have stated, the traffic figures under discussion are very conservative. They do not include hundreds of motor miles of truck hauling, considerable motor-cycle use, and an amount of horse-drawn traffic that is hardly negligible. Other factors should be considered, too, in determining the full use of this road system, but I have given enough data to make it perfectly clear that we must soon begin the paving of at least the main belt-line highways, if they are to be expected to be kept in condition for the enormous traffic of the future that is inevitable.

In the long run paving will be cheaper and infinitely more satisfactory. The worst section of the belt line should be paved first, then a program covering the pavement of other parts of this main road system should be undertaken. Such a program would require several years to execute, but as it progresses the cost of maintaining the system would be considerably reduced each year.

It would be a splendid step to begin the paving next year under an appropriation of, say, $100,000. In this connection it may be recalled that in the sundry civil act of June 12, 1917, the following appropriation was made for Yellowstone Park, which would seem to indicate that Congress intended to have at least the main belt line paved: "For resurfacing and for finishing the belt line with oil macadam, $20,000."

ROAD MAINTENANCE AND IMPROVEMENT.

During the past year the work of repairing and improving the road system has been entirely under the control of the National Park Service, and has been executed under the direction of the superintendent of the park and engineers of the bureau.

In the fall of 1918 general road construction and maintenance was continued as late as the weather conditions permitted, and in the spring of 1919 small crews made necessary repairs to roads and bridges. Some sprinkling was done in June, but the system was not entirely organized until the early part of July. Owing to the extreme dryness of the season, many sources of water supply failed, thus making it necessary to place double tanks on two of our 5-ton trucks to make sprinkling possible where water was not available. For three weeks in August the road crews, except those on sprinkling duty, were used in forest-fire fighting, compelling a cessation of all work of repairing and improving the highways. Most of the work of the season was therefore confined to ordinary maintenance and repair activities with much interruption and costly moving and changing of camps, corrals, and equipment.

The following is a brief summary of the work accomplished along these lines, together with some construction work performed since the date of the last report:

Main Belt Line.—On the main belt line, in addition to ordinary repair and upkeep, including sprinkling, the following work was accomplished:

On the Mammoth to Norris Road 3 miles of graveling was completed, 2 miles on the Norris end, and the remaining mile at Beaver Lake and at Indian Creek.

Four miles from the lake on the Thumb to Lake Road, 1,500 feet of road was reshaped and graveled.

At the canyon the approaches to the Chittenden Bridge were improved, and the sharp turns in the Artist Point Road were removed.

Three miles of the Dunraven Pass Road were widened and the bad turns improved. Four fills were made over culverts. Two concrete culverts, each 4 by 6 by 42 feet long, were constructed. Six concrete culverts were lengthened about 13 feet to carry the fills. One hundred and twenty feet of 18-inch galvanized-iron culverts were installed and 180 feet of 24-inch. The remaining work to be done on the Dunraven Pass Road includes the making of fills over deep ravines into which concrete culverts have been placed and widening 1 mile of road, most of which is rockwork.

At Geode Creek and Elk Creek, on the Tower Falls Road, fills were made over concrete culverts built in 1917.

The large steel bridge over Cascade Creek at the canyon was painted and redecked. The steel span over the Gardiner River, the arch over Tower Creek, and the steel bridge at the Montana-Wyoming State line on the north entrance road were painted and repaired.

North approach.—In October proposals were opened for the construction of three-fourths of a mile of road around the Gardiner Slide on the opposite side of the Gardiner River from the old road. The contract was awarded to Gibbons & Reed, who commenced work on November 1. The contract quantities were 42,000 cubic yards of excavation, of which a large percentage was rock, 590 cubic yards of reinforced concrete, 806 cubic yards of loose-rock wall. Also included in the contract was the wrecking of one 75-foot span steel bridge and replacing it on newly constructed abutments. The above contract work totaled $42,084.84. In addition to the contract work $19,356.20 was expended in graveling the road, salvaging two steel bridges, and providing protection against the slide damming the Gardiner River. It is no doubt the proper solution of the slide problem, and is from all appearances a guarantee against any future trouble from this source. This new piece of road was opened for travel on April 14, and was entirely finished before June 1.

West approach.—Nine and one-half miles of this road from the west boundary have been finished during the past four years with oil macadam. Of this, the first 5 miles are in excellent condition, the oiled surface being 18 feet wide and showing little signs of wear. On the remaining 4½ miles the surface is only 10 feet wide and in many places is raveling and breaking badly, so that the general condition is poor. The remaining 4 miles have not been surfaced, but the road is in good condition. No repairs to the macadam, owing to the labor shortage and lack of funds, were made this year, but it is imperative, in order to save the remaining part of the road, that these repairs be made next year.

East approach (in the park).—Very light grader work, ditching for drainage and repairs to wooden culverts was the extent of the work done on this road. The Fishing

Bridge over the Yellowstone River at the Lake Outlet was repaired. All damaged and missing piles were replaced, and an ice break of piling was constructed upstream from each bent of the bridge.

East approach (in the Shoshone National Forest).—The 28 miles of the Cody approach road in the Shoshone National Forest was maintained in excellent repair. General bridge and road upkeep was continued throughout the season. Unfinished repairs to revetments damaged by the washouts of the spring of 1918 were completed. One king post bridge, with 30-foot span, was erected of logs to replace the old wooden bridge over Gunbarrel Creek. Approaches to the Grinnell Creek Bridge were made, and the road one-fourth mile eastward was widened, and the alignment improved.

South approach (in the park).—Light bridge and road repairs were made in July. There are over 200 wooden culverts on this road, the poorest of which will be replaced by galvanized-iron culverts next year.

South approach (in the Teton National Forest).—A small crew made light bridge and road repairs from the south boundary of the park to the neighborhood of Moran. Three and one-half miles of road in the vicinity of the Pilgrim Creek Bridge were improved, and the necessary culverts installed. Ten feet of the concrete decking on the north end of the Snake River Bridge was replaced. At Moran 4,700 linear feet of road was graveled 10 feet wide and 6 inches deep.

Cooke City Road.—The large steel bridge over the Yellowstone River was painted. Light bridge and road repairs, with a few minor grade improvements, were made from the Tower Falls Junction to Pebble Creek. We also made a survey for a new bridge site over the Lamar River.

TRAIL REPAIRS.

Two small crews with pack transportation were employed most of the summer, except when the work was interrupted to take care of forest fires, in cutting out fallen timber, and making slight repairs to grades and corduroys on trails so as to render them passable for saddle horses. The total number of miles gone over was as follows:

	Miles.
Lamar River-Mary Bay Trail	48
Upper Yellowstone Trail	35
South Boundary Trail	33
Willow-Park-Riverside Trail	27
Riverside-Fountain Trail	15
Hellroaring-Slough Creek Trail (part)	8
Slough Creek Trail	15
Shoshone Trail	16
Do	20
Total	217

SIGNS.

The metal signs purchased last year showing road junctions and milepost signs were placed on posts made of old 1¼-inch pipe, painted. Many of the signs showing names of objects of interest, trails, etc., have not yet been placed, due to lack of skilled labor for this work.

TELEPHONE AND TELEGRAPH LINES.

Of the 269 miles of grounded telephone and telegraph lines maintained by this office in the park, 207 miles underwent quite extensive repairs during the past season, as follows:

From—	To—	Miles.	Character of repairs.
Headquarters	Gardiner	5	Poles reset; wires tightened.
Do	Upper Basin	48	Do.
Canyon	Thumb	31	Do.
Lake Junction	Sylvan Pass	19	Heavy repairs for first 18 miles, ½ mile new line relocated to avoid snowslides through the Sylvan Pass.
Sylvan Pass	East entrance	7	Light repairs.
Thumb of Lake	South entrance	23	Do.
Firehold Cascades	West entrance	16	Do.
Headquarters	Soda Butte Station	35	Reset all poles for 20 miles and tightened wires; balance 6 miles light repairs.
Swan Lake Flats	Gallatin Road	23	Poles reset; wire tightened.

Connection was made with the Western Union Telegraph lines in April, 1919, by attaching to the wire in the park leased by the Yellowstone Park Hotel Co. This gives us a connection for our official messages directly from our office to Helena, Mont., instead of having to file them at the hotel in summer and telephone them to Gardiner in the winter.

The whole telephone and telegraph system in the park ought to be reorganized on a scale that will provide adequate service by the Government at reasonable rates for all concessioners and the public. The maintenance of a telephone line in the park is necessarily expensive. At least one-half of our 269 miles of line runs through timber, most of which is lodge-pole pine, which is easily uprooted by winds, and much damage occurs from fallen timber. The timber available in the park for poles is almost worthless, and lasts in the ground but a few years, necessitating rebuilding frequently. If all lines in the park can be consolidated under Park Service control, their use by all interests will warrant the expense of more substantial construction, with consequent improved and

cheaper service. At present the Government line serves the camping company and connects our headquarters with ranger stations, road camps in summer, and with the railroad station and business houses in Gardiner.

A separate wire connects at the north entrance with the Mountain States Telegraph & Telephone Co.'s long distance line. Our lines are connected through a 50-drop switchboard, with power ringer, to 48 telephones at headquarters, 20 on park lines, and 8 in the village of Gardiner, and in summer reaches all hotels in the park through the hotel company's switchboard at Mammoth Hot Springs.

BUILDINGS AND OTHER STRUCTURES.

At headquarters one double set of officers' quarters in the abandoned fort was converted into flats suitable for four families.

One of the large stone Cavalry stables was remodeled to accommodate the blacksmith shop, machine shop, and garage.

The ports in the Gardiner gateway arch were closed and sealed up, making a temporary automobile-checking station.

Two small frame buildings were erected about 1 mile south from Gardiner, for use as temporary storehouses for T. N. T. which was received from the surplus stock of the War Department. At one time we had 200,000 pounds of this explosive stored in these buildings.

Two camps were developed for use of private camping parties traveling in automobiles at Mammoth Hot Springs. The first one that was improved consists of the old wagon sheds near Mammoth Camp. Here open fireplaces were built for cooking, flush toilets with sewer connections installed, and the grounds lighted by electricity, and first-class water piped in. The second was developed later under the hill in the edge of the timber by the lower house, where the ground was cleared of fallen timber and débris, running water was piped to the grounds, and earth closets provided.

The Beehler River ranger station in the southwest corner of the park was painted, and a new root cellar was built, all by labor of the regular ranger force.

A new snowshoe cabin was built on Maple Creek by the rangers at Riverside Station late in the fall of 1918.

About 3½ miles of fence inclosing the fields at the Buffalo Farm, on the Lamar River, were rebuilt with new posts, and the corrals, shoots, and squeeze necessary in handling the large herd of tame buffalo were also rebuilt.

LANDSCAPE WORK.

A vista was cut through the woods from the Tower Falls-Mammoth Hot Springs Road in order that beautiful Wraith Falls might be opened to the view of tourists traveling over this road.

Another vista was cut below the Upper Basin-Thumb Road in order that Duck Lake might be better observed by passing visitors. This lake is a perfect gem in a setting of dense forests, and the vista that opened it to public gaze was much appreciated.

On the Mammoth Hot Springs formation much dead wood and other débris were removed, making a great improvement in the appearance of some of the terraces, among them Angel Terrace, one of the most remarkable and beautiful terraces of the Mammoth Hot Springs district.

All of this work was done under the supervision of Landscape Engineer Punchard, who also directed some landscape work at the Mammoth Camp and at other resorts in the park.

WATER SUPPLY AND POWER PLANT.

Water system.—The water supply furnishing park headquarters at Mammoth Hot Springs, including all concessioners, park employees, Mammoth Hotel, and Mammoth Camp, with water for domestic purposes, watering lawns, and for running the power plant is drawn from Panther Creek and Gardiner River, 7 miles south, and from Glen Creek 4 miles south. At the mouth of Panther Creek are located two concrete diversion dams and head gates, which divert the water for 18,480 linear feet north through reinforced-concrete pipe 24 to 27 inches in diameter to the head of Golden Gate, where it is emptied into Glen Creek. At a distance of 7,200 feet downstream the water is again taken from the stream by a diversion dam and head gate and is carried in vitrified pipe varying in size from 18 to 24 inches in diameter to the main reservoirs. This is a concrete structure pentagonal in shape, in size about 181 by 195 feet, and 10 feet deep at the lowest point, located just across the road from the largest terrace of the Mammoth Hot Springs. Its capacity is 2,025,000 gallons. This storage capacity is supplemented by the old reservoir which is located immediately adjoining and above the main one, of earth construction, capacity 2,000,000 gallons, filled by the overflow from the main reservoir. For domestic uses, watering lawns etc., the water is carried by mains to the buildings and grounds, so arranged that they can be connected directly with the reservoir, or connection can be made with a smaller reservoir some distance higher and southward, thus giving higher pressure in case of fire. The watershed is guarded from contamination to the extent of prohibiting camping on it, and tests of this water have shown it to be reasonably pure.

The hotel company has an adequate water supply at all of its hotels in the park. But the supply for the camps at Upper Basin and Canyon is neither adequate nor satisfactory from several standpoints, and there is much to be done to develop a good supply of pure water at these points, as well as several others where it is desirable to establish public camps for use of tourists traveling in their own automobiles.

Power plant.—Water is conducted from our two reservoirs at Mammoth Hot Springs to the hydroelectric power plant through a penstock 26 inches in diameter, 2,000 feet long, with a drop of 310 feet, made of riveted sheet steel laid mostly on top of the ground and painted. This penstock is so connected and supplied with valves that water can be used from either or both reservoirs. The power plant is housed in a modern building of reinforced-concrete structure with tile roof, concrete floors, steam heated, and lighted with electricity. The main building is 31 by 76 feet in size, with a wing 11 by 46 feet for housing the penstock and control valves, and a concrete tail race and weir. The water is delivered to three De Olier turbines with Frances runners, each rated at 280 horsepower

under 300 feet head and 900 revolutions per minute. The speed is governed by Lombard type L–1 governors. These turbines are directly connected to three Westinghouse revolving field alternators, each 3-phase, 60-cycle, 150 kilowatts, 2,300 volt, 37.7 amperes per terminal. The exciters are also Westinghouse belted to main alternators, each having a capacity of 8 kilowatts at 125 volts. The switchboard is a modern one, with voltage regulators, oil switches, and necessary instruments. A small machine shop with power lathe, emery wheel, and air compressor in connection with power room makes it a very complete plant.

This plant furnishes electric current for lighting all buildings at Mammoth Hot Springs, including the Mammoth Hotel and Mammoth Camp. The extensive grounds at headquarters are also lighted from this plant by means of eighty 90-watt tungsten lamps, arranged in series of 20, with shunt coils. It also furnishes power to our shops and those of the transportation company. The total production of the plant for the past year was 143,860-kilowatt hours. This production is limited at times by supply of water, but is sufficient for all needs up to the present date. The power lines and street-lighting fixtures which have been in constant use since 1903 are showing wear and will have to be replaced within a year or two.

Other electric plants for lighting purposes are maintained in the park by the Yellowstone Park Hotel Co. at Old Faithful Inn and Canyon Hotel, both run by steam power, and by the Yellowstone Park Camping Co. for lighting Canyon Camp, run by a gasoline engine which also pumps water to the camp from Yellowstone River.

ICE.

During the past winter 287 tons of ice was harvested at Mammoth by regular park employees and stored.

LAKES AND IRRIGATION.

I am advised that there are several irrigation projects under consideration which propose to raise the water in Lake Yellowstone and Lewis, Shoshone, and Heart Lakes, as well as flood the basins of the Falls and Bechler Rivers in the southwest corner of the park, all of the water to be stored thereby to be used in Idaho. It is understood that it is proposed to take the Yellowstone Lake water through the Continental Divide in tunnels.

I am not advised as to the use that will be made of this water, but I know that these lakes and basins can not be used as storage reservoirs without seriously injuring the scenic beauty of Yellowstone Park and greatly impairing, for generations to come, its usefulness as a national playground. Furthermore, this commercialization of its waters would constitute a precedent for encroachment of other interests that have been held away from the park since early days. Once the park is opened to exploitation of its natural resources, anything may afterwards happen to it.

FISH COMMISSIONER'S VISIT.

For the purpose of making a careful study of the fish supply of Yellowstone National Park and to ascertain by personal inspection what ought to be done to extend and improve the opportunities for catching fish in the waters of the park, Dr. H. M. Smith, commissioner of the United States Bureau of Fisheries, spent the period between July 8 and August 14 in the park. His survey of the park waters was most complete, and from the data that he has collected he expects to develop a policy for the extension of the operations of his bureau in the park that will make this reservation one of the greatest fishing resorts of the world. Dr. Smith also collected data that will be used in the publication of information on the fish of the park supplementary to that already available.

One of the factors in the fish supply of the Yellowstone National Park is the white pelican. It nests on two small islands in Yellowstone Lake, and the adult birds wander widely in search of food, which consists almost exclusively of live trout. The annual consumption of fish by young and old pelicans is large. The question is whether the consumption is so great as to justify or require a thinning out of the pelicans. Dr. Smith, while in the park during the summer, visited the pelican islands for the purpose of taking a census of the young birds and their parents and of estimating the quantity of fish consumed annually.

FISH PLANTING.

The United States Fish Hatchery located near the outlet of Yellowstone Lake was operated during the summer season as usual under the direction of the superintendent of the Federal hatchery at Bozeman, Mont., Mr. W. T. Thompson, who states that regardless of the unprecedented dry season the operations were quite successful. Eggs of the native, or black-spotted, trout were collected during July and August as follows:

From tributaries of Yellowstone Lake:	
Pelican Creek	1,569,000
Clear Creek	1,804,500
Cub Creek	294,500
Columbine Creek	718,000
Miscellaneous small streams between lake hatchery and Thumb	234,700
Clear, Cub, and Columbine Creeks in August	1,668,000
	6,288,700
From Fish Lake, near Soda Butte Station	685,000
Total harvest for the season	6,973,700

According to the Commissioner of Fisheries and the hatchery officers, an encouraging feature of the season was the very large proportion of young spawning fish appearing in the various streams, apparently the result of plants made in the past few years, and indicating a return of fish in their former abundance before the depredations of the pelicans, gulls, etc., had made inroads on the stock in Yellowstone Lake.

A consignment of eastern brook trout was shipped from the Bozeman Hatchery to the park on May 29 for planting. A full load of brook and rainbow trout was delivered at the same point early in September. And a total of 572,200 of the young black-spotted

trout hatched in the park were returned to the waters of the small streams tributary to Yellowstone Lake by the employees of the hatchery. A full list of the numbers planted is as follows:

Date.	Waters.	Number.
	Eastern Brook trout.	
May 20	Lava Creek	9,600
	Glen Creek	10,500
	Blacktail Creek	10,500
Sept. 3	Upper Firehole River	4,000
	Little Firehole River	4,525
	Nez Perce Creek	5,000
	Mallard Lake	4,000
		47,525
	Rainbow trout.	
Sept. 3	Gibbon River	40,000
	Glen Creek	15,000
	Lupine Creek	15,000
	Panther Creek	17,500
		87,500
	Blackspotted trout.	
July and August	Planted from fish hatchery in small streams tributary to Yellowstone Lake from which they were taken	572,000
	Total fish of all kinds planted in park waters	707,025

The operation of this subhatchery is most important, since it is almost the sole source of supply for eggs of the native trout for Federal, State, and local hatcheries. For this reason alone it is essential that the waters of Yellowstone Lake and its tributaries be kept well stocked.

On the other hand, I am of the opinion that a considerably larger portion of the fish nurtured in the Yellowstone Lake hatchery ought to be returned to the waters of the park. In this connection I call specific attention to the fact that 6,973,700 eggs were collected in the watershed of Yellowstone Lake, and only 572,200 young trout were returned to these waters. I understand that the percentage of fish hatched from eggs in a hatchery is very much greater than a similar number of eggs would produce under absolutely natural conditions, and I do not contend that an insufficient number of young fish were planted in tributaries of Yellowstone Lake this year, but I do express the opinion that more young blackspotted trout should have been placed in other streams in which they would thrive, and which are now barren of fish or not well stocked.

FISHING BY TOURISTS.

During the early part of the season tourists reported good catches of trout, and until well along in August the sport was greatly enjoyed by visitors to the park, particularly those who brought their own camping equipment and established themselves near good fishing streams. All of the tourists who made trail trips had no difficulty in catching plenty of fish.

During approximately the last month of the season, which it must be remembered is one-third of the entire tourist season, motorists and others who toured the roads of the park had great difficulty in catching any fish at all. This lack of success must be attributed largely to the fact that there were so many people fishing in the park during the first six weeks or two months of the season that the streams became considerably depleted.

Next year it is proposed to make a census of the amount of fish caught in the park by visiting tourists in order that we may gain accurate information as to the condition of the fish supply. It is proposed to do this by asking motorists and other visitors at the park entrances to keep an account of the fish taken from the waters of the part and report their figures to the rangers at the gateways from which they leave the reservations.

Our records indicate that black bass were planted in 1895 in Goose Lakes, situated in Lower Geyser Basin. No trace of them was ever found, but during the past year several parties have reported positively that they caught good strings of yellow perch in these lakes, and they can be accounted for only by presuming a mistake was made in planting them instead of the black bass.

Very recently a catch of landlocked salmon (*Salmo sebago*) was made in Lewis Lake. This fish was planted in the park waters in 1909, but had not been seen since that year. So certain were we that the landlocked salmon reported this year were either Loch Leven (*Salmo levenensis*) or brown (*Salmo fario*) trout that specimens of the fish were given the most careful examination by men who are familiar with all of these species, but it was finally concluded by all that the Lewis Lake catch was a salmon and not a trout.

FISHING BY HOTELS AND CAMPS.

For many years it has been the practice to permit the catching of fish in some of the waters of the park, particularly in Yellowstone Lake, for table use in the hotels and camps; these catches, however, to be made after the spawning season had ended. Because of the apparent depletion of fish in so many streams of the park this year, I reached the conclusion that this practice ought to be discontinued, and by an order made effective

August 15, 1919, the further catching of fish for table use in the hotels and camps, except by tourists in strict accordance with the rules and regulations, was prohibited.

Between the opening of the season and the effective date of this order the Yellowstone Park Hotel Co. took 5,327 pounds of fish from Yellowstone Lake, and the Yellowstone Park Camping Co. took from the same waters 2,164 pounds.

WILD ANIMALS.

The weather conditions for the wild animals were ideal during the past year. Forage grasses were abundant last fall, as there had been plenty of rain all summer; the winter was mild and snowfall light, enabling the animals to get at the grass without difficulty. Consequently there was scarcely any loss whatever among the elk, deer, antelope, and mountain sheep. The loss from legitimate hunting in the adjoining States was also slight, as pleasant weather lasted through most of the hunting season. The elk and deer did not leave the park while hunting was permitted.

The new ranger force, which on October 1, 1918, relieved the soldiers as protectors of the wild life, proved to be a great improvement in this line of work, and evidences of poaching within the boundaries of the park were very rare. They were also able to give much special attention to the care of the wild animals, preparing to feed hay if necessary, killing carnivorous animals that prey on others, etc. About 100 tons of alfalfa hay were purchased from near-by ranches for feeding these animals, but for the first time in several years the winter was so mild that there was no necessity for feeding hay to wild game, and the stacks were held over for next winter's supply. For the same reason the animals were widely scattered during the winter and were not easy to count and keep track of.

The past summer has been exceedingly dry. To begin with, the snowfall of last winter was light, spring opened up earlier than usual and melted what little snow there was stored in the mountains, and during June, July, and August there was less rainfall than was known for many years. The consequence is that the range lands are baked, and the grass is stunted and dried to the very mountain tops. The prospects for food for our wild animals during the coming winter are therefore most discouraging. The same conditions have prevailed throughout the State of Montana and other mountain States near the park, and this shortage of forage crops is recognized and is being met by shipping thousands of domestic cattle to Eastern States, where forage is plentiful and reasonable in price. Hay is very scarce and high priced. The situation would seem to be almost a critical one for the elk, demanding the utmost efforts to prevent a tremendous loss of these animals. Preparations are being made to meet it in the best possible manner. About 200 tons of wild hay will be available on Slough Creek, where it is hoped large numbers of the elk, which usually leave the park if forage is not plentiful there or covered with snow, can be held. One hundred tons of hay bought a year ago is still available, about a hundred tons of oat-hay is being harvested on the field at the north entrance, and allotments have been secured and about 470 tons of alfalfa hay in stack have been purchased from the farmers nearest the park down the Yellowstone Valley. We shall therefore have about 870 tons of hay available for feeding wild animals during the winter, which should, with careful handling, do much toward keeping the northern herd of elk from starvation. We also have a call on an additional 100 tons of hay in the Yellowstone Valley which can be purchased if needed. Alfalfa hay that cost $18 per ton in the stack last year is worth $25 a ton now.

Elk and deer are seen much more frequently in summer by tourists than before the automobile came into general use, for the reason that people travel later in the evening and earlier in the morning, when the animals are out feeding. Small herds of elk and a few scattering deer were seen by many travelers. Moose frequently and, in at least one instance, wild buffalo were seen by tourists traveling with saddle horses over the trails.

Antelope.—The antelope wintered, as usual, near the northern entrance, but were so much scattered that a careful count of them could not be made. During the summer they have ranged well back in the hills of the northern section of the park and are apparently in fine condition at the present time. A female antelope lost at the buffalo farm when very young has become a pet of the family of the buffalo keeper and attracts much attention at the big farm where she makes her home.

Deer.—The deer, like the antelope, were scattered, and but few of them came around headquarters for something to eat. Immediately after the tourist season closed this year a herd of about 10 mule deer and a group of 3 white-tailed deer took up their range on the lawns about headquarters, and as I write this I can observe the former herd feeding in front of the office.

Elk.—The elk, by far the most numerous of any of our wild animals, wintered in splendid condition. Regardless of the fact that forage was plentiful inside of its boundaries, several thousand elk left the park and went into the Absaroka National Forest and down the Yellowstone River Valley, possibly from force of habit from preceding winters, when they were obliged to go out in search of food. These, however, were carefully guarded from poachers by forest rangers, and it is believed that practically all of them found their way back to the park in the spring.

The increase in the northern herd of elk was normal. The losses were small, consisting of a few killed by carnivorous animals, a few more killed outside of the park during the hunting season in Montana, and 100 shipped to South Dakota in March, 1919.

Every person in this country who is interested in the conservation of wild life, who wants to see a supply of big game sustained, who wants Yellowstone National Park to hold its prestige as a great natural preserve, should give attention to the problem confronting us at the present time in caring for the elk. The time is coming when a terrible, long, cold winter is going to kill the Yellowstone elk herds if existing conditions outside the park are maintained. That time may be the coming winter; however, it may be a winter of 10 years hence. No one can say when this calamity will strike us, but those of us who know conditions about this park realize that the extinction of the elk is inevitable unless these conditions are changed.

Years ago, when unusually cold winters drove the elk out of the park regions, they found ample range on the hills and in the valleys of lower altitudes. One great herd moved northward, and another, that now ranges most of the year in the Snake River watershed of the park and in State game preserves south thereof, moved southward to

the Jackson Hole. Other smaller herds moved down the Shoshone watershed on the east, the Madison River Valley on the west, and the Gallatin River Valley on the northwest. Slowly settlements on these winter feeding grounds crowded back the elk, and for a time the grazing of cattle and sheep of settlers was permitted right up to the park line, except south and southeast of the park, where many years ago the State of Wyoming with wise foresight established great game preserves, in which the grazing of domestic stock was not permitted. This extensive grazing of stock around the park caused great losses of elk, especially in the Gallatin and Madison herds, which are now represented by comparatively few animals.

Recently, however, the Forest Service has withdrawn considerable areas of adjacent grazing lands from the use of domestic stock, and the State of Montana, of course, has created a number of important game preserves which have aided materially in protecting the elk in normal years, but little has been accomplished yet by any agency in anticipation of the winter, when complete destruction of the elk will come. The Biological Survey made one move in the right direction when it acquired its elk farm near Jackson, Wyo., in the Flat Creek district of the Jackson Hole.

Undoubtedly more of these farms must be provided outside of the park for the purpose of raising hay and storing it for use only in winters, when the elk can not shift for themselves without destroying hay, grain, and other property of farmers in the path of their migration. The Biological Survey farm near Jackson should be greatly extended, possibly to the purchase of all lands in the Flat Creek Basin, for the purpose of protecting the southern elk herd against the destructive winter; and another large area in the Yellowstone Valley north of the park should be procured for the similar protection of the northern herd, which now leaves the park and goes down this valley in hard winters, destroying farm property and causing other damage. These elk farms would be simply as an insurance maintained against destruction of the elk. In open winters, such as last winter, these elk farms would not be used, all stored hay being retained for time of real need. So far as the park is concerned, there is nothing that we can do to hold the elk when fearful storms drive them from their range within its boundaries or cover it deep with snow.

There is ample summer range for all the elk in the park and the adjacent game preserves of Wyoming and Montana. However, there is a growing demand in the Jackson Hole for grazing privileges in the Teton Game Preserve south of the park, which, if secured, may seriously impair the summer range of the southern herd. The Buffalo Fork region is chiefly sought for domestic stock, but there are some who would pasture cattle up to the south boundary of the park. It is proposed in pending legislation to add all of this region to the park with the headwaters of the Yellowstone River and the Teton Mountains. This territory is also the winter range of several of the smaller bands of elk.

Moose.—Moose were seen in nearly every part of the park in small numbers. The rangers from Lake Station saw 67 in Upper Yellowstone and Pelican Valley on their patrols during the month of January. One of our largest moose herds ranges in the marshes and meadows of the Bechler River and Falls River Basins, in the far southwestern corner of the park, and is thriving splendidly. Recent estimates place the number in the herd at slightly more than 500. There is an irrigation scheme being developed which, if approved by Congress, will result in flooding this entire region and in driving out the moose, probably to destruction. There is also a growing band of elk in this section that ought to be considered in passing on any use of these park lands for reservoir purposes.

Buffalo—Wild herd.—Reports received during the winter indicate that the wild herd of buffalo is on the increase. During January the rangers from Lake Station saw 55 in Pelican Valley. During April Assistant Chief Ranger Trischman saw 52 on Pelican Creek and a different herd of 38 on Saddle Mountain, making a total of 90 animals counted, which is more than have been known for several years back. One member of this herd was found dead at Turbid Lake.

Buffalo—Tame herd.—The tame herd of buffalo is located on Lamar River near the mouth of Rose Creek. At present the herd consists of 413 animals, having increased from a herd of 21 animals purchased in 1902. Ninety calves were born during the year, 8 of which were born in September. Five of these, however, were killed recently while the herd was being vaccinated, leaving but 85 alive at the present time, of which 50 are males. Thirty of these bulls were castrated. The following data relating to the buffalo calves were compiled on October 15, 1919:

	Males.	Females.
Ninety calves born since last annual report	53	37
Killed while being vaccinated, Oct. 8 and 15	3	2
Total alive	50	35

Of the entire herd 355 animals, including all of the calves, have just been vaccinated for hemorrhagic septicemia. Besides the calves already mentioned, one of the old cows was killed during the process of vaccination.

One 3-year-old bull was donated to the city of Mexico, Mo., shipped January 19; one yearling bull was shipped to the city of San Francisco, Calif., on February 12, and one 3-year-old bull was shipped to the State game warden of Wyoming on May 24.

The 1918 calves were vaccinated for hemorrhagic septicemia by a veterinarian sent for the purpose from the Bismarck, N. Dak., office of the Bureau of Animal Industry. This work was done on November 10, and the second time on November 20 and 21, when 60 per cent of the male calves (16 in number) were castrated.

The winter was so open and forage so plentiful that up to the end of January it had not become necessary to feed hay to the tame buffalo, but they had been permitted to range for several miles around the farm. The latter part of January a number of them died, and investigation indicated they might be afflicted with hemorrhagic septicemia, notwithstanding the fact that for several years the young animals have been vaccinated for this disease. A telegraphic request was sent for assistance from the Bureau of Animal Industry, and Veterinarian J. Wallman was sent from the Helena, Mont., office. His investigation indicated the presence of the disease, which has been dreaded since it first appeared, in the fall of 1911. The herd was taken up at his advice and fed hay

through the balance of the winter. All carcasses of those that died were destroyed by burning. At least 36 buffalo died during this epidemic, and a few more were missing that might have died on the range, but the carcasses were not found. A culture has been developed recently that is believed by the Bureau of Animal Industry to be a certain preventive, and the whole herd, including old and young, is being treated with the fresh vaccine as this report is written.

A show herd of 18 buffalo bulls was kept in the pasture at headquarters throughout the tourist season and was driven up twice daily where tourists could see them. Visitors to see this herd averaged about 100 per day.

Approximately 300 tons of hay are available for winter forage for this herd. This is none too much, but will probably, with careful handling, meet all needs, though it will be necessary to keep the herd out on the range as long as possible before beginning to feed hay. Meadows are being developed and seeded that will eventually yield an abundance of good hay, but the past season was so dry that the crop was short. The main herd was kept on Mount Norris and the higher slopes during most of the summer so as to save the forage lower down for late fall and winter grazing.

Bears.—The grizzly, black, and brown bears were plentiful and much in evidence throughout the park and attracted so much attention and were so much talked about that the few tourists who failed to see them felt disappointed. These bears were so mischievous that it was necessary to keep a night guard at Upper Basin, Lake Outlet, and Canyon to prevent damage to private automobiles and camps, and five had to be killed at Lake during the summer to prevent damage to property. One medium-sized grizzly was killed in September at Upper Geyser Basin in a fight with a larger grizzly.

In addition to the bears that made a habit of frequenting the regular camping places, garbage dumps were established within walking distance of Upper Basin and Canyon, where bears of all kinds congregated every evening just before dark, and it was a regular practice for people from the hotels and camps to go to see them. A wire was firmly stretched between trees and posts to keep people from going beyond the danger line, and a ranger was placed on duty with a rifle to protect them. This is one of the most interesting features of the park to the majority of tourists, but requires careful regulation.

But even more interesting than the bear dumps were a few clever bears, among them one or two families consisting of mother and cubs, that frequented the highway between Thumb and Lake Outlet and daily "held up" passing automobiles and begged for food. As a rule the tourists so held up were willing victims of the robbers, and most of them would risk being tried before the United States commissioner for violation of park regulations, which prohibit "approaching, molesting, or feeding the bears," rather than turn a deaf ear to the appeals of the cubs for candy, peanuts, etc. This rule is the most difficult to enforce of all the park rules and regulations, as indicated by the fact that of 28 trials before the United States court during the past summer for violation of regulations not one was for this offense.

Coyotes, wolves, and mountain lions.—These represent by far the most destructive of the carnivorous animals in the park, and efforts are constantly made to keep them down to a reasonable number. Three hunters devoted most of their time from November to March, inclusive, hunting and trapping them, and quite a number were also killed by rangers on regular patrols. Altogether there were killed in the park during the year 227 coyotes, 6 wolves, and 11 mountain lions. The pelts were sold on commission at the big auction sales in St. Louis by Funsten Bros. & Co. and the net proceeds deposited in the United States Treasury with other park revenues. The total receipts from this source amounted to $1,943.49. It is hardly practicable, even if desirable, to entirely exterminate these carnivorous animals, but a certain amount of hunting and trapping each year keeps them down to a reasonable limit. They kill annually quite a large number of young elk, deer, antelope, and mountain sheep.

Mountain sheep.—Mountain sheep were seen in about the usual numbers and were in excellent condition, but they did not come down as often as usual during the winter where they could be seen, because there was but little snow on the mountains and a construction camp was located all winter in Gardiner Canyon, which kept them back to some extent from their usual winter habitat.

Beaver.—Signs of beaver, consisting of dams, houses, stumps, and pieces of trees which they cut down for food, are found in many places close to the road and afford much interest to travelers. Beaver are plentiful and widely distributed throughout the park. A most interesting series of colonies has been established on Elk Creek in the Tower Falls region. From an automobile one may count 10 dams, one below the other, on this stream.

Porcupines, squirrels, etc.—Other small animals, such as porcupines, rabbits, ground squirrels, red squirrels, woodchucks, and chipmunks, are abundant and seen by nearly all visitors. Several varieties of mice, pocket gophers, lynx, otter, mink, weasels, foxes, marten, skunks, badgers, and bats are more or less abundant, but are not often seen by tourists.

GRAZING AND FORAGE FOR WILD ANIMALS.

The time seems to be approaching when the antelope, deer, mountain sheep, and the large herds of elk must have more attention in the matter of artificial feeding. The opportunity for raising alfalfa and other tame grasses to be cut for hay for their winter use is ample, but will require the expenditure of several thousand dollars at the beginning to develop the meadows and construct irrigation systems.

Since the advent of motor-driven vehicles, grazing of domestic animals is permitted only to the extent necessary to keep the few horses required in the administration and protection of the park and the cattle actually necessary to furnish fresh milk to the public at hotels and camps. Even the cattle that are slaughtered for meat for hotels and camps are no longer pastured in the park as formerly, but are slaughtered outside and the meat brought in. The summer grazing of cows for milk, saddle horses in use by tourists and engaged in park patrols and other necessary work, and work horses on Government construction and maintenance work is maintained principally at the higher

altitudes, on the summer range for game, which is plentiful. It is the winter range which is getting scarce and which must be carefully guarded. The greatest extent to which it is now used is for wintering the surplus stock (saddle, pack, and work horses) belonging to the Government, and which is not in use during the winter season. These amount to but from 30 to 60 head, wintered at Yanceys or on Slough Creek, and much of the winter they subsisted on wild hay cut in low places, very little of which would be grazed by the elk. But it is contemplated raising this hay on a larger scale, to be available for feeding game if necessary. A total of about 250 tons of wild hay has been cut and is now in stack on Slough Creek for such use the coming winter. Arrangements are being made to develop these meadows by draining if necessary, and introducing red top to make a larger quantity of better quality hay.

CULTIVATION OF LAND.

Up to date comparatively little of this work has been done. But the example of the 45½-acre field located at the northern entrance gate to the park, proves what can be accomplished by cultivation and irrigation of fields for meadows. This field was taken up in 1904 and seeded to alfalfa, which is cut and stacked for winter forage for antelope, deer, and mountain sheep. It has yielded many tons of excellent hay for this purpose, besides being a wonderful improvement from a landscape viewpoint. This field, however, has given trouble by foxtail grass coming in and running out the alfalfa, and it has to be taken up and recultivated often. It was broken up last year and seeded to oats, which yielded a crop of 1,638 bushels of oats of unusually fine quality, and 13 tons of the straw was baled for use for bedding at the stables. This season it was again sowed to oats, but owing to the exceedingly high price of hay it was cut green and put up for winter hay, producing about 100 tons. There are a number of tracts where hay can be raised for use of game, and for feeding Government stock in use in the park, much cheaper than it can be bought.

This work has been quite successfully carried on at the buffalo farm on Lamar River, where it was necessary in order to procure sufficient forage for the tame buffalo herd. A tract of 70 acres was cultivated and sowed to timothy in 1912, and has yielded a good crop of hay annually ever since. Aside from this tract, we have had to depend upon cutting wild hay in that vicinity for the tame buffalo, but the herd is now getting so big that the supply of hay must be supplemented by starting more tame meadows. There is ample opportunity for this work in the vicinity of the buffalo farm, and 279 acres of excellent land has been plowed up. We expect to get between 100 and 200 acres of this seeded to timothy and alsike clover before snow flies. One hundred acres of this land was sowed to oats last spring with a view to cutting for hay, but the season was extremely dry and water for irrigating ran short, so that the oats did not grow large enough to cut and only afforded good pasturage for the tame herd of buffalo.

BIRDS.

While nearly 200 varieties of birds have been recorded in the park, many of these are seen but rarely. Some of those that are most interesting and seen most commonly are as follows: White pelican, gulls, Canada geese, swans, and several varieties of ducks are common to the lakes and larger rivers. Great blue heron are seen along streams and in marshy places. Sandpipers, killdeers, grouse, hawks, osprey, magpies, ravens, crows, Rocky Mountain jays, Clark nutcrackers, blackbirds, robins, western bluebirds, sparrows, swallows, meadowlarks, finches, and warblers are more or less abundant. The northern water ouzel, or dipper, is a most interesting songster that remains all winter. They nest close to the water, usually a swift stream, in late winter or very early in the spring, and their extremely sweet song and frequent diving to the bottom of the swift current for food are bound to attract interest.

The nest of a trumpeter swan (*Olor buccinator*) was discovered by Mr. M. P. Skinner on a low island in a lagoon northeast of Lewis Lake, and on his second visit on September 6 he saw the parent birds and three young ones old enough to fly. This is remarkable, inasmuch as it is the first authentic record we have on file of this bird breeding in the park, and it is even rarely seen here.

The unusual dryness of the season has had its effects on our birds, as well as on the mammals. Such ground-nesting birds as sparrows, finches, meadow larks, juncos, grouse, ducks, and geese have attained full growth in unusual numbers, due to absence of cold, drenching rains during incubation and brooding. Possibly the same result was helped by the paucity of ticks, mosquitoes, and flies, due also to the dry season.

The fall migration of all birds has been unusually early, and the mammals of all kinds and sizes from ground squirrels to elk are seeking winter quarters much earlier than usual.

GEYSERS, HOT SPRINGS, AND OTHER PHENOMENA.

The small geyser at Norris, located across the road in the timber from Black Growler, was seen to play several times during the summer.

The Fishing Cone at Thumb played frequently to a height of about 40 feet. This is quite an unusual occurrence, and is thought to be due to the fact that the level of the lake is several feet below the usual low-water mark.

During the tourist season, except at night when the formations were obscured, a careful record was kept by the ranger force stationed at Upper Geyser Basin of the activities of the principal geysers in that basin. The results of this record indicate a reasonable regularity in playing and but few changes of importance from previous years. This record shows that the Grand Geyser, one of the most powerful and beautiful geysers in the basin, played 50 times during the period June 20 to September 4, inclusive. Old Faithful, the world's most famous geyser, and the object of greatest interest to all Yellowstone Park visitors, played with its usual regularity. The interval between its eruptions this year averaged 75 minutes.

The geyser record mentioned above follows:

Date.	Giant.	Giantess.	Oblong.	Grand.	Sawmill.	Beehive.	Castle.
June 20		12.00 m.					
21							2.30 p. m.
23				9.00 a. m.			
25				8.25 p. m.	9.00 a. m.		3.10 p. m.
27							4.00 p. m.
30		7.30 a. m.					
July 1	3.15 p. m.						
2						9.00 a. m.	
3				9.45 a. m.			
4			8.30 a. m.	9.00 a. m.			
5		10.00 a. m.		10.40 a. m.			
6		8.00 a. m.		9.00 a. m.			
8				10.30 a. m.			
9				9.25 a. m.			
10				4.15 p. m.			12.15 p. m.
11		6.45 a. m.					
12			9.45 a. m.	9.50 p. m.			
13	2.25 p. m.			9.40 a. m.		8.40 p. m.	
13				8.55 p. m.			
14				7.15 a. m.			8.25 a. m.
14				7.40 p. m.			
15				7.30 a. m.			
15				10.30 p. m.			
16				7.30 a. m.			
17				6.15 p. m.			10.00 a. m.
18				7.30 a. m.			
18				7.30 p. m.			
19				3.20 p. m.			4.15 p. m.
21		2.30 p. m.		12.45 p. m.			
22				5.25 p. m.			
23				3.15 p. m.			
24				1.30 p. m.		2.00 a. m.	
25				8.25 a. m.			
26				2.00 p. m.			1.30 p. m.
27			11.30 a. m.				
28		10.30 a. m.		11.15 a. m.			
29	3.00 p. m.			8.30 a. m.			
31				8.00 a. m.			
Aug. 1							
1							2.00 p. m.
3	9.40 a. m.	8.00 a. m.		7.45 a. m.			
4				5.15 p. m.			5.10 p. m.
7				10.00 a. m.			
7				7.30 p. m.			
8							12.50 p. m.
9				11.45 a. m.			
10		3.00 p. m.					
11				4.00 p. m.			
12				1.10 p. m.			
13		9.15 a. m.		9.30 a. m.			3.55 p. m.
13				7.00 p. m.			
14	7.30 a. m.			7.00 a. m.			8.45 p. m.
14				3.30 p. m.			
16				9.00 a. m.			6.15 p. m.
16				6.50 p. m.			
17				6.30 a. m.			
18		9.40 a. m.	9.15 a. m.	9.00 a. m.			
19							5.00 p. m.
20				3.00 p. m.			3.15 p. m.
22		9.15 p. m.					
24	9.00 p. m.			9.45 p. m.		8.45 p. m.	7.00 p. m.
24						12.15 p. m.	
25				7.10 p. m.			
26			9.20 a. m.				
27	1.45 p. m.	6.00 a. m.					12.15 p. m.
28				12.50 p. m.			
Sept. 2	2.00 p. m.						
4				11.00 p. m.			
10							4.00 p. m.

The Daisy plays every 85 to 90 minutes; the Grotto every 3 to 4 hours; and the Riverside every 6 to 7 hours. The Grand goes at times two or three days without playing, but as a rule it plays about three times every 24 hours. These observations were taken by Rangers Watkins and Harrison and by Asst. Chief Ranger Charles J. Smith.

Consultation with men who have lived in the park for many years developed the general opinion that the geysers and hot springs were less active than usual on account of the extremely dry season due to lack of winter snows, an early spring, and lack of rains during the summer. The paint pots of the park, especially the Mammoth Paint Pots in Lower Geyser Basin, appear to be less active, due undoubtedly to lack of subsurface water.

About September 1, 1919, a quiescent paint pot near the south approach road and a few hundred feet east of the Thumb Ranger Station, belched forth a considerable amount of

material of the color and consistency of whipped cream, which ran down the slope toward the hot spring basin. This paint pot is less active now, but is still puffing out some of its peculiar thick liquid.

FORESTS.

The forests of the park are in good condition. There are no tree diseases epidemic here, nor do there seem to be any insect pests attacking the forests. There are evidences that the porcupines are causing injury to more trees than usual, but this is a matter that requires further consideration before any definite statement can be made regarding it.

Natural reforestation is rapidly covering several old fire scars with fine growths of new timber. While traveling on the trails this season I observed some really remarkable examples of reforestation, one young forest about 15 years old, near Lake Yellowstone, having all trees growing a considerable distance apart and in other respects thriving as a better growth than its surrounding forests.

FOREST FIRES.

The season was the dryest one in the history of the park, and consequently the danger of forest fires was great. This danger was apparent at the beginning of the tourist season, and extra precautions were taken to prevent them. Special notices were printed requesting care in extinguishing cigar and cigarette butts and matches before throwing them away, and these were pasted on the wind shield of cars entering the park, and otherwise distributed where they could be seen by everybody. Patrols gave special attention to visiting camping grounds to see that fires were put out, and when carelessness was apparent the guilty parties were apprehended if they could be found and tried for violation of the regulations. With the forests as dry as they were during the past summer, cigarette and cigar butts were among the most dangerous fire risks we had to contend with, if not the most dangerous, as they are thrown away carelessly, without thought of the possible consequences. They have been observed here to burn for several minutes after being cast aside, if fanned by a gentle breeze. Of 306 small fires extinguished along the road by our patrols and others during the past summer, about one-fourth were evidently started by cigar or cigarette butts. In spite of the great danger of forest fires on account of the extreme dryness, the heavy travel, and the fact that about 80 per cent of this park is timbered more or less heavily and dead timber is everywhere in evidence along the roads and trails, we were fortunate enough to be free from serious forest fires up to about July 21, but from that date until about September 5 we had a succession of fires in various parts of the park that required the use of most of our road crews, the ranger force, and as many extra men from adjoining villages as we could get to keep them within bounds. This seriously delayed important improvement work on roads and trails, and cost about $25,000. The following shows location, date, cause, and extent of the important fires:

Location.	Date reported.	Extent.	Cause.
13¾ miles south of Mammoth	June 15	Small	Cigarette stub.
Near Norris Hotel	15	5 acres	Do.
Fall River	July 21	11 acres	Camp fire.
Pitchstone Plateau	30	7 acres	Lightning.
Thumb Station	22	Small	Camp fire.
Slough Creek	24	Do	Do.
Spring Creek	10	40 acres	Unknown.
Kepler Cascades	20	3 acres	Camp fire.
Do	21	2 acres	Do.
Gibbon Meadow	25	1 acre	Do.
Near Canyon Hotel	24	Small	Do.
Boundary Lake	Aug. 10	15 acres	Unknown.
Mountain Ash Creek	13	2,000 acres	Lightning.
Blacktail Deer Creek	20	8 acres	Camp fire.
Specimen Ridge	21	25 acres	Do.
Colter Creek	25	Small	Lightning.
Lewis Lake	27	3 acres	Camp fire.
Grizzly Peak	28	2,500 acres	Lightning.
Shoshone Geyser Basin	29	650 acres	Unknown.
Phlox Creek	29	10 acres	Lightning.
Mirror Plateau	29	1,200 acres	Do.
Grayling Creek	Sept. 25	200 acres	Unknown.
Crowfoot Ridge	28	Unknown	Do.

In addition to this list, about 225 camp fires and small fires that had been abandoned were extinguished by ranger patrols, other park employees, and others traveling in the park. Most loyal assistance was given by concessioners in cases of emergency, and in many cases tourists assisted in fighting fires. It is considered extremely fortunate that with all of the large forest fires we had to contend with none were close enough to the road to disfigure the landscape, and most of the timber that was damaged was of no particular value. The principal damage, therefore, was in the cost of fighting the fires and the delay of important work on roads and other projects underway on account of the necessity for taking the men for fighting fires.

Several of the fires burned over old scars and consequently caused no injury to the park aside from the expense of extinguishing them. Such a fire was the one listed above as burning 650 acres in the vicinity of Shoshone Geyser Basin.

FIRE AND OTHER PATROLS.

Discussion of the forest fires of the past summer prompts further mention of the efficient work of the Yellowstone Park ranger force. While fires were raging over hundreds of thousands of acres of forests of the Northwest (and the fire hazard was greater here,

probably, than in any other part of this region) the ranger force of the Yellowstone prevented absolutely any fire damage to this park during June and July. It was only when fires started in the most remote sections of the park or when several fires were spreading at once that the situation became serious. Even in these trying times it took the ranger force, aided by the road crews, only a relatively short time to quench the flames.

Fire patrols were maintained throughout the summer by permanent rangers traversing the trails on horseback, while temporary rangers on motor cycles patrolled the roads for the purpose of extinguishing abandoned camp fires and preventing violations of the automobile rules and regulations. From every standpoint I feel sure that the use of one or two aeroplanes for fire patrol would be a most desirable aid to our system of protecting this park, and I hope that some arrangement may be perfected before the opening of next season whereby the Army may be able to assign machines for use in the park during the time of greatest danger from fires. It is also desirable that a fire lookout station be established on Mount Washburn. This mountain commands a vast expanse of the best forests of the park.

The use of motor cycles for making road patrols was very successful. Six machines were purchased for this purpose and with five of these in use the roads were covered twice daily, except when rains interfered or we were short of riders or mechanics. A few more machines are necessary to keep up a proper system of patrols, and these will be purchased for next year.

Eleven snowshoe cabins were repaired by the ranger force late last fall, and supplied with bedding and other necessities for use of rangers making patrols on skiis or snowshoes in winter.

A night watchman has been employed to protect property at headquarters since January 14.

ARRESTS.

Arrests for violation of park regulations were made as follows:

Charged with—	Action taken.	
	Reprimanded.	Tried and fined $5 to $100 and costs.
Speeding	7	11
Breaking, or marring by writing names on, formations	5	
Leaving camp fires unextinguished		14
Obnoxious conduct	2	3
Total	14	28

The above list includes only those cases where official action was taken. There were many cases where rangers warned tourists in time to prevent depredations, and in many other cases that were not flagrant reprimands were administered on the spot, and the cases were not recorded.

This record of arrests speaks well for the efficiency of the new ranger force and stands out in contrast with the record for last season, when but two trials were recorded and not an arrest was made for similar offenses under the military protective force.

STREAM GAUGING.

The work of conducting water resource investigations in the park during the season of 1919 was done under the supervision of Mr. Carl G. Paulsen, district engineer, United States Geological Survey, Boise, Idaho, who visited the park August 5 to 7. Readings were taken at the gauging stations and reports made by the rangers when practicable. A recording gauge was installed on Madison River 4 miles from the western park boundary in October, 1918. Summaries of current meter measurements and discharge data are not now available, but will be published in the Annual Water-supply Papers of the United States Geological Survey for the Missouri and Snake River drainage area.

FRANCHISES AND PERMITS.

The following is a brief statement of the utilities and other enterprises operated in Yellowstone National Park in 1919 for the accommodation and entertainment of the traveling public. They are all operated under contracts with the department or under temporary permits from the National Park Service, under the strict regulation of this bureau as to service and rates. The statement also mentions improvement in these plans made or contemplated by their owners.

The Yellowstone Park Hotel Co. operated the hotels at Mammoth Hot Springs, Upper Geyser Basin, and Grand Canyon of the Yellowstone from June 20 to September 20. For reasons already given, the hotel at Lake Outlet was not opened this season. The company is now engaged in making extensive repairs to its properties. These include a very attractive porte-cochère for the Lake Hotel and large new female help dormitories at the Canyon Hotel and at Old Faithful Inn. The latter extensions will considerably increase the capacity of the hotels affected to accommodate tourists.

The Yellowstone Park Camping Co. operated camps at Mammoth Hot Springs, Upper Geyser Basin, and Grand Canyon during the entire season, and Camp Roosevelt, at Tower Falls, was run during July and August, but was not large enough to accommodate more than a limited number of people. At the Lake Outlet the company maintained a few tents and served meals to a limited number in cases of emergency.

In May, 1919, Mr. Howard H. Hays, for many years general advertising manager of the former Wylie Permanent Camping Co., during the year 1917 associated with the

Union Pacific and North Western lines as tour manager, and under the United States Railroad Administration first manager of the Bureau of Service, National Parks and Monuments, purchased the controlling stock interests of the Yellowstone Park Camping Co. Furthermore, Mr. Hays assumed the active management of this enterprise and personally guided its affairs throughout the season.

In the course of the summer and up to the date of this report Mr. Hays has made many notable improvements in his camps and has several very important projects under construction at the present time, chief among them being the fine new central building at the Lake Camp, which I considered elsewhere. Before the opening of next season Lake Camp will be largely rebuilt, and new flush toilets and other sanitary facilities will be installed.

At Mammoth Camp heavy timber supports were placed through the center of the large main building to strengthen its construction and to improve its appearance. A new sewer system was built. An ornamental fence was constructed so as to shield the service yard from view from the east side of the main building, where the view is superb; the driveway on this side of the building was discontinued and the porte-cochère removed. The lawn on the west side of the camp was plowed up, cleared, and leveled preparatory to seeding to grass, and a gravel driveway and walk built. In the early future a swimming pool will be constructed in or adjacent to this camp and other extensive improvements will be made. On the part of the Government the approach to the Mammoth Camp should be greatly bettered from the landscape standpoint.

At the Canyon Camp several new buildings were constructed in strict accordance with the architectural scheme of the camp.

At the Geysers Camp, in Upper Geyser Basin, the new dining-room extension was completed and used for the first time on August 22, when a trout dinner was given to the visiting governors' party. A new kitchen is well under way at this camp. If weather conditions permit, a new central building or lodge will be constructed this fall at Camp Roosevelt, near Tower Falls, and before the opening of the next season this attractive camp will be expanded and improved in other directions.

The Yellowstone Park Transportation Co. operated the only transportation line in the park and met all trains at Gardiner, Mont., Yellowstone, Mont., and Cody, Wyo., during the tourist season. Service was also maintained on a twice-a-week basis from the belt road to Moran, Wyo., in Jackson Hole, for parties desiring to take this side trip. One hundred 10-passenger automobiles and seventeen 7-passenger touring cars were used in this service.

This company also maintained repair stations at several points in the park and sold gasoline, oil, and other supplies at Mammoth Hot Springs, Upper Geyser Basin, Lake Outlet, and Grand Canyon. It did not, however, carry an extensive assortment of automobile parts. It should be required to carry fairly complete lines of these parts next year.

During the autumn or early next spring the company will construct three very attractive filling stations. They will be built of stone and logs and will be located near the stores at Upper Geyser Basin, Lake Outlet, and Grand Canyon.

The Yellowstone Park Boat Co. rendered little service to the public this season. Its store at the lake was operated by C. A. Hamilton. This company has very little useful boat equipment. Its big boats are in poor condition and will not meet present demands for service on the lake, and its small boats, except two 45-foot gasoline boats and a few launches, are old, dilapidated, and unsafe. This company has not furnished satisfactory equipment for boat service since 1916. It should be required to purchase new equipment before the opening of the next season and be prepared to meet all demands for rowboat and launch service as well as for longer trips to the upper arms of Yellowstone Lake. If it can not meet the requirements of the Service, some other individual or corporation should be found who will develop the recreational advantages of this beautiful lake.

Of course the store privilege at the lake will be exercised next year by Mr. C. A. Hamilton under his new arrangement with the department.

Mr. J. E. Haynes maintained his picture shops at Mammoth Hot Springs, Upper Geyser Basin, and Tower Falls, with photograph stands in all hotels and camps. He was also equipped to develop negatives and make prints for tourists who photographed the features of the park with their own cameras. Mr. Haynes expects to construct a new picture shop at Mammoth Hot Springs before the opening of next season. Plans for the same are now ready to submit to the Service.

Mr. C. A. Hamilton operated his general store at Upper Geyser Basin, and under a subleasing arrangement with the Yellowstone Park Boat Co. operated its store at Lake Outlet. In addition to general merchandise and groceries, Mr. Hamilton carried full lines of curios and souvenirs and also operated gasoline and oil stations. He is now engaged in building a fine new store at the lake, which will take the place of the boat company's store. The new filling stations of the Yellowstone Park Transportation Co. at Upper Basin and Lake will be operated by Mr. Hamilton under a cooperative agreement approved by the Service.

Mr. Hamilton expects to arrange for the maintenance of a store next year in the old lunch station of the Yellowstone Park Hotel Co. at the Thumb of Lake Yellowstone, where the south approach road joins the belt-line system.

Mr. George Whittaker, postmaster of Yellowstone Park, operated his general stores at Mammoth Hot Springs and at the Grand Canyon of the Yellowstone. He also carried stocks of curios and souvenirs and maintained gasoline stations. Mr. Whittaker is now engaged in building a very commodious and attractive new store on his Canyon site. This building is being erected of logs and will be ready for use next season.

Mesdames Pryor and Trischman continued the operation of their ice-cream parlors and curio store at Mammoth Hot Springs. They are now engaged in remodeling the front of their establishment according to plans approved by the landscape engineer. This improvement will greatly enhance the appearance of this popular curio shop.

The Geyser Baths.—The bathhouse privilege at Upper Geyser Basin was transferred by Frances F. Brothers, under approval dated December 4, 1918, to Henry P. Brothers, who personally ran the business in a very satisfactory manner during the summer.

Pack outfits.—Movable-camp party licenses were issued during the season in favor of the following-named parties:

	Saddle and pack animals.	Wagons or baggage trucks.	Tourists.
Thomas E. Newcomb, Gardiner, Mont.	15	.....	5
Charles C. Moore, Fort Washakie, Wyo.	18	2	11
George T. Hopkins, Cody, Wyo.	35	.....	15
I. H. Larom, Valley, Wyo.	7	.....	2
L. H. Joy, Teton, Wyo.	7	1	6
Joe A. Jones, Valley, Wyo.	27	.....	6
Howard Eaton, Wolf, Wyo.	79	6	66
S. N. Leek, Moran, Wyo.	12	.....	6
Clarence Ryerson, Gardiner, Mont.	10	.....	2

This increase in the number of pack trains in use in the tourist business of the park, together with the fact that many of the parties who patronized this class of transportation remained for several weeks, indicates a revival of interest in trail travel which is most gratifying.

Transportation to Cooke.—Special permits were issued to parties interested in the development of the mining town of Cooke, Mont., to use their motor trucks and service cars to haul ore and supplies to and from Gardiner, Mont., through the park, as follows:

	Motor trucks.	Service cars.
Nels E. Soderholm, Cooke, Mont. (merchant)	1	.....
Frank R. Lind, Gardiner, Mont. (contractor for hauling U. S. mail)	1	.....
Western Smelting & Power Co., Cooke, Mont., and Seattle, Wash.	1	1
R. I. McKay, Cooke, Mont.	3	1

The permit dated March 28, 1917, held by Mr. Robert I. McKay, covering the construction of a metal-surfaced road through the park connecting Gardiner and Cooke, Mont., was canceled on November 27, 1918.

Moving-picture companies.—Representatives of moving-picture companies operated in the park under special permits from the Service, as follows: Pathe Co., in June; C. L. Chester, of New York, in August; Famous Players-Laskey Co., of New York, August and September; International Film Service, October 7 to 10, to get special pictures of tame buffalo herd.

CONVENTIONS AND SPECIAL PARTIES.

Montana Bankers' Association.—Two conventions were held in the park during the season. On August 8 and 9 the Montana Bankers' Association met at Mammoth Hot Springs. Headquarters were maintained at the Mammoth Hotel and the various sessions of the convention were held in the assembly hall at park headquarters, formerly the post exchange of Fort Yellowstone. The Montana bankers, after transacting the usual business of the association, devoted much of their remaining time to a discussion of road improvement in their State.

National Park Touring Association.—On August 11 and 12 representatives of 12 Western States met in the assembly hall at Mammoth Hot Springs for the discussion of the interpark highway plan and for the purpose of devising ways and means of completing the selection of this highway system and marking the same. The development of travel over the park-to-park highway was also one of the topics of the convention program. At the close of the first day's session the National Park Touring Association was formed and the following officers elected: Gus Holms, of Cody, Wyo., president; G. L. Ramsey, of Helena, Mont., vice president; and L. L. Newton, of Cody, secretary-treasurer.

The new association proposed at once to undertake the selection of the park-to-park highway through cooperation with highway associations, chambers of commerce, and automobile clubs, and to conduct a scouting expedition over the various routes at an early date. Furthermore, it pledged its support to the department and to the Service in encouraging travel to and between the parks and in securing large appropriations for park-road improvement. Likewise it declared itself in favor of concentrating State funds on interpark highways until they are in first-class condition. The convention adjourned to meet again at the call of the president, with the understanding that in the meantime a vice president for each Western State was to be chosen.

The governors' conference.—In August the Western Governors' Conference was held in Salt Lake City, and at the conclusion thereof the State of Utah, through its chief executive, entertained most of the visiting governors with a tour of Yellowstone National Park. The party traveled from Salt Lake City to the western gateway on a special train of the Oregon Short Line, arriving on the morning of August 22. The tour of the park was made in three days. At Upper Geyser Basin a trout dinner was tendered the party by Mr. Howard H. Hays, general manager of the Yellowstone Park Camping Co., and several special side trips were arranged by the Yellowstone Park Transportation Co.

The following governors toured the park: Hon. Simon Bamberger, governor of Utah; Hon. O. A. Larrazolo, governor of New Mexico; Hon. H. J. Allen, governor of Kansas; Hon. John C. Townsend, jr., governor of Delaware; Hon. Thomas W. Bickett, governor of

North Carolina; Hon. R. A. Cooper, governor of South Carolina; Hon. Thomas E. Campbell, governor of Arizona; Hon. Ben W. Olcott, governor of Oregon; Hon. James B. A. Robertson, governor of Oklahoma; Hon. William C. Sproul, governor of Pennsylvania; Hon. Oliver H. Shoup, governor of Colorado; Hon. Lynn J. Frazier, governor of North Dakota; Hon. Robert D. Carey, governor of Wyoming; Hon. Samuel R. McKelvie, governor of Nebraska; Hon. Joseph M. Carey, ex-governor of Wyoming; Hon. William Spry, ex-governor of Utah; Hon. Heber M. Wells, ex-governor of Utah.

Brooklyn Eagle tour.—A large party under the leadership of the Brooklyn Eagle visited Yellowstone National Park July 27 to 31, inclusive, in the course of a comprehensive tour of American and Canadian national parks. The party came here in two sections from Rocky Mountain Park, one section traveling in a special train and the other making the interpark trip by automobile. The entire party stopped in Cheyenne on July 25 to attend the famous Frontiers' Day Celebration. Leaving here on August 1 this party proceeded by automobile to Helena, Mont., thence by both special train and automobile it proceeded to Glacier National Park. Under special instructions from the director, I accompanied this party from Denver to Glacier Park.

It will be impossible to overestimate the importance of the tour of the Brooklyn Eagle party, as it was the first party of eastern people to travel between a group of parks by special train and by automobile service, and likewise it was the first party to make an "international interpark" tour.

International Association of Rotary Clubs.—This organization held its annual convention in Salt Lake City just prior to the opening of the park season, and on the first and second days of the season more than 800 Rotarians entered the park by the western gateway, making the complete tour.

Massachusetts Forestry Association.—This association, under the leadership of its secretary, Harris A. Reynolds, and Dr. Clinton L. Babcock, visited Yellowstone National Park July 4 to 10, inclusive.

Travel Club of America.—A considerable number of members of this club tourned the park July 24 to 29, inclusive. Both the Massachusetts Forestry Association and the Travel Club of America made the Yellowstone trip as a part of a comprehensive tour of all of the big national parks of the West.

United States Chamber of Commerce party.—On August 16 a score of officials of the United States Chamber of Commerce, headed by its president, reached the northern gateway and during the next three days made a complete tour of the park.

APPROPRIATIONS.

The sundry civil act of July 19, 1919, made available for the administration, protection, maintenance, and improvement of Yellowstone National Park the sum of $255,500, very much less than has been available annually for the park during the past 8 or 10 years. Considering further the fact that labor and equipment costs were higher than ever before, this year's appropriations were very inadequate, and should be more than doubled next year if the needs of the Yellowstone are to be even approximately met.

REVENUES.

On the other hand, the revenues of Yellowstone Park were very largely increased, and at this time it appears likely that they will total $125,000 for the current fiscal year, or nearly one-half the appropriation for the upkeep of the park. The revenue fund will certainly exceed the cost of the administration of the affairs of the park and the protection of its great area by nearly $35,000.

The war season of 1918 produced relatively small revenues, but really more than we expected under the conditions. The following is a statement of the receipts of the park for the fiscal year ended June 30, 1919, as deposited to the credit of miscellaneous receipts of the United States Treasury:

Sale of automobile and motorcycle permits	$31,863.22
Collected from corporations and individuals operating stores, permanent camps, the transportation line, and picture shops[1]	7,914.92
Sale of electric current	886.25
Sale of water	286.80
Sale of hides of carnivorous animals killed by rangers	1,425.23
Miscellaneous collections	399.08
Total	42,775.50

PERSONNEL.

All of our men who left to engage in the World War were taken back into our permanent organization, except a few who did not care to return. Other discharged soldiers who applied for work were given employment on the temporary force; in fact, at no time during the summer were men turned away, as labor was scarce, and it was necessary to raise the pay of laborers to $4 a day to keep our men from leaving.

Employees of the park purchased war savings stamps aggregating $898.79, fourth Liberty loan bonds aggregating $14,300, Victory loan bonds aggregating $11,100, and subscribed to the united war-work fund $474.58. Great interest was also taken in the Red Cross work, and practically all permanent employees and their families belonged to the local branch.

VITAL STATISTICS.

Births.—A baby girl, Frances Muriel Stinnett, was born to Mr. and Mrs. Bert Stinnett, our master mechanic, on September 8, 1919.

Deaths.—On November 15, 1918, Thomas G. Frazier, buffalo keeper in the park, died at the Buffalo Farm of influenza.

On April 24, 1919, Wayne Sweney, 3-year-old son of Chauncey M. Sweney, assistant electrician, died of scarlet fever. Two cases occurred in the family, but only one resulted fatally.

[1] Hotels not opened in 1918.

On July 18, 1919, James Baxter Hughes, of Gueydon, La., a 4-year-old boy traveling with his grandparents, died at Old Faithful Inn from shock caused by burns sustained by backing into a small hot pool the day before at Thumb.

On July 29, 1919, E. M. Hach, of Portland, Oreg., died at Mammoth Hotel. He was touring the park in his private automobile. He was a sufferer from tuberculosis, and was in a very weak condition when he arrived here. His body was embalmed and shipped to his home.

On August 15, 1919, Mr. Louis D. Boatsman, of Morrill, Nebr., touring the park with his aunt and sister, while bathing in Yellowstone River, dived from the bridge across the lake outlet on the Cody Road and was instantly killed by striking his head on the bottom and fracturing his skull.

In September rumors became current in and around the park that a man had been killed by a female bear at Old Faithful while he was endeavoring to take a tin can from the nose of one of her cubs. This report has never been corroborated, nor have we been able to trace its source, and I am of the opinion that it was pure fiction.

ACCIDENTS.

Considering the unusual number of people in the park during the entire season, serious accidents were exceedingly rare, and but one resulted fatally. The most serious accidents noted were as follows:

On July 8 a small boy broke through the geyser formation near the Giantess Geyser in Upper Geyser Basin and burned his feet quite seriously. This was known to be a dangerous place, and danger signs were posted, but, as is often the case, they were not heeded. With increased travel the time seems to have come when more than signs at some places in the geyser basin are needed to keep people out of trouble, as often danger signs are not taken seriously. At this very place one lady asked if it really was dangerous or if the sign gave the name of the geyser. Another said it was not dangerous, for she walked over it and did not break through.

James Baxter Hughes, 4-year-old son of Mr. R. H. Hughes, of Gueydon, La., who was traveling through the park with his grandparents, backed into a small hot pool at Thumb on July 17 and was so seriously burned that he died of the shock the following night. Undoubtedly this little boy was not being carefully watched by his guardians or the accident would not have happened. Since this occurrence there have been some suggestions submitted relating to the fencing of all hot springs and geysers, but this should not be done, for the reason that barriers of this kind would not only be unsightly but would in all likelihood not prevent unguarded children from suffering injury. Furthermore, fences would be extremely costly to install, and there are hundreds of hot springs in the park.

On July 30 one of the 10-passenger cars of the transportation company was tipped over through the fault of the driver speeding around a double curve about 14 miles south of Madison Junction. Three of the seven passengers in the car were stunned and quite severely shaken up, but no bones were broken. The driver was tried before the commissioner for violation of park rules and regulations and fined $100 and costs.

The same evening a 10-passenger car with a load of hotel employees out for a "joy ride" left the road and ran into a tree and telegraph pole. The most serious injury to any of the occupants was a broken arm.

On August 16 an elderly man touring the park with a party of friends stumbled and fell into the edge of Prismatic Lake at Midway Geyser Basin. Fortunately the lake is large enough so that the water is comparatively cool at the edges, and he was not fatally burned. He was well enough to travel, and left the park with his party on August 18.

On August 23 a 10-passenger car belonging to the Yellowstone Park Transportation Co. and carrying members of the governors' party collided with a Ford car traveling in the opposite direction while rounding a curve in the upper end of Hayden Valley. A lady in the Ford car was thrown out into the road and the left front wheel of the big car was smashed, but fortunately no one was injured beyond a few slight scratches and bruises. Among the occupants of the car were the governors of Pennsylvania, Oregon, Utah, and South Carolina. I was in a car following closely, and after consultation with the occupants of both cars it appeared to me that the accident was a result of both drivers violating the rules of the road, and that, under all of the conditions as they were shown, a proper punishment was a reprimand to both drivers, and this was administered by both myself and, later, the United States commissioner, who, upon hearing the evidence in the case, reached the same conclusion as I did.

The same day my official car was struck at Virginia Cascades by a Dodge car driven by a girl 18 years of age. The fenders of both cars were damaged, but no further injury was sustained. Both the girl who was driving and her father, who was in another car ahead, were reprimanded and dismissed. The fact that three of the drivers of the four concerned in these two accidents were quite young convinced me that the regulations should provide an age limit for people permitted to drive automobiles on park roads, and this will be recommended when the subject of revision of park rules and regulations comes up later in the year.

MEDICAL SERVICE.

Notwithstanding the fact that we have available at headquarters a large, modern hospital building thoroughly equipped with beds and bedding, kitchen and dining-room furniture, office furniture, heating and sterilizing plant, surgical instruments, and medicines, it has not been practical to make provision for medical service, due to scarcity of suitable men for the work. During the past summer the hotel company has employed a doctor, whose services could be had in emergency, and a trained nurse was stationed at each hotel and camp, but for the other nine months the nearest place where medical attention can be had is at Chico Hot Springs, about 40 miles away. The town of Gardiner, 5 miles distant, has no doctor or trained nurse.

This situation is almost intolerable, and at the earliest possible date we must make some arrangement for medical service here. If a qualified physician can not see his way clear to establish himself here with the hope of building up a profitable practice, we must seek additional appropriations from Congress to employ an experienced doctor at an adequate salary.

CHURCH SERVICES.

During the past year church services were held in the chapel irregularly, but whenever a minister was available. Rev. J. F. Pritchard, Episcopal missionary from Emigrant, Mont., furnished by the bishop of Montana by arrangement with the bishop of Wyoming, filled the pulpit every two weeks during the summer, and other ministers were invited to hold services when visiting the park.

SCHOOL AT HEADQUARTERS.

A private school was maintained during the past winter for the benefit of children of permanent Government employees and employees of the business enterprises who remain in the park the year around, the expense being borne by the parents of the children. This is one of the very few places in the United States under exclusive Federal control where no school facilities of any sort have been provided by the Government, and I feel that some steps should be taken to remedy this situation.

MOTION PICTURES.

Under a cooperative plan developed by the park employees, motion-picture entertainments were held once a week, beginning December 28, 1918, after the influenza epidemic had subsided to the extent that large gatherings were considered safe. A similar arrangement will be worked out for the coming winter, and it is expected that the citizens of the neighboring town of Gardiner will participate.

RECOMMENDATIONS.

Travel to Yellowstone National Park is increasing with such amazing rapidity and such varied uses are being made of this great reservation by its throngs of visitors that it is very difficult to think of any desirable improvement that should not be made in the immediate future. The needs of the park are very great and certainly require the annual expenditure of considerably larger appropriations than have recently been made by Congress. The more important of the urgent needs of the park follow:

1. The Teton Mountains and the headwaters of the Yellowstone River, with much of the country between, should be added to the park. Pending legislation provides for this logical and necessary extension of Yellowstone's boundaries.

2. More funds should be provided for the upkeep of the road system. Under existing high labor and material costs not less than $300 per mile should be expended on this system next year.

3. A program providing for the gradual paving of the belt-line highways should be immediately adopted. Such a program should provide for the paving of sections of these highways according to their cost of upkeep, the most costly sections to be paved first. One hundred thousand dollars should be made available for this work next year.

4. Eighteen years ago the road between the Thumb of Lake Yellowstone and Bridge Bay near the outlet of the lake was realigned, a very scenic highway being abandoned in favor of a shorter route, with heavy grades, over a high divide. This scenic road along the lake shore should be restored at once. The existing road is exceedingly hard to maintain, is steep, dusty, and almost devoid of scenic features. Small cars experience great difficulty in negotiating its grades. It can not be sprinkled. The old road when restored would afford a lake drive that would be one of the most popular features of the park tour. It would be about 5 miles longer, but this additional distance is of no importance in these days of motor cars.

5. The road that now runs so close to Lake Hotel and Lake Camp should be changed to follow the lake shore from the hotel to the junction of the Cody approach road with the belt-line system at the so-called "fishing bridge" over the Yellowstone River, where it leaves Yellowstone Lake. This realignment would cost comparatively little, but would tremendously improve conditions at the lake and would especially benefit the traveling public utilizing the hotel and camp by removing the harassment of noisy automobile traffic at night.

6. The Firehole Cutoff Road between Madison Junction and the Cascades of the Firehole should be completed. The major portion of the work on this scenic road was completed by the Army Engineers, but we have had no funds available to undertake the work of finishing it. It will cost $25,000 to complete this project.

7. Ever since automobiles were admitted to the park the finest geysers and hot springs of Lower Geyser Basin have been practically inaccessible to motorists. This is because the old wagon road is badly located and wholly unfit for automobile travel. It should be entirely rebuilt, and this work ought to be undertaken next year. It will cost approximately $17,500 to make this improvement. Among other things it will open to all visitors to the park such wonders as Firehole Lake, the Black Warrior, the Great Fountain Geyser, Surprise Pool, Broken Egg Pool, and the White Cone.

8. The Cody or eastern approach road should be improved by the construction of seven new bridges in the forest east of the park and by the reconstruction and graveling of approximately 4 miles of that portion of the road between Sylvan Pass and Lake Yellowstone. The south approach road should be improved by the construction of a number of new bridges and culverts and by the elimination of curves and the reduction of grades on certain sections of this highway.

9. The Inspiration Point Road should be improved by considerable work of widening and the construction of guard rails and other protective measures, the establishment of adequate parking places, etc. This improvement should also include the construction of a walk along the rim of the Grand Canyon for the use of pedestrians. The present road is not satisfactory for motor travel and is distinctly dangerous to walking parties.

10. There is a crying need for the immediate construction of several large new automobile camp grounds for the use of motorists who bring their own camping outfits into the park. Next year the camps at Upper Geyser Basin, Thumb, Lake Outlet, Grand Canyon, Tower Falls, and Norris Geyser Basin should be improved by the extension of the water system, and much attention should be given to the sanitation of these camps. This free automobile camp system should be progressively extended and improved year by year, and as soon as possible not less than 30 major camps should be made available.

11. Many of the ranger stations of the park are in a dilapidated condition and should be rebuilt. The greatest need is for new stations at Upper Basin, Lake Outlet, and the Grand Canyon. They should be built next year and should be large enough to accommodate several park rangers, a divisional highway engineer, and a large information office in which maps, national park circulars of information, and other data useful to the public may be made accessible to tourists. Several snowshoe cabins used by the park rangers in winter should be rebuilt.

12. Attractive gateway structures should be erected at the Cody or eastern entrance and at the Yellowstone or western entrance to the park. Plans for the Cody entrance have already been approved but funds have not been available for the construction of this gateway. Both of these entrances are as important as the northern gateway, which already has a very imposing and interesting arch.

13. The National Park Service and the Yellowstone Park Hotel Co. each maintains a telephone line, and the hotel company maintains a telegraph line. None of these lines is in satisfactory condition. They should all be consolidated and maintained by the National Park Service as in the case of Yosemite Park. This would make it possible from the financial standpoint for the Government to build and maintain a first-class telephone and telegraph service for the public as well as for the park administration and the business interests of the Yellowstone.

14. More funds should be provided for the seeding, cultivation, and draining of hay lands, in order that larger supplies of hay for buffalo and other animals may be available hereafter.

15. By special authority of law the National Park Service now maintains the approach roads to Yellowstone Park through the forest reserves east and south of the park. Enormous tourist traffic on the north approach road from Livingston to Gardiner is now placing a tremendous burden of road maintenance on the county treasury, which, in view of the large size of the county and the small amount of taxable property therein, is a particularly hard burden to bear. It would seem that the Federal Government should bear the cost of upkeep of at least half of this approach road, and I recommend that this proposition be given the earnest consideration of the Service and of the department with a view to bringing it to the attention of Congress.

16. Gallatin County and the State of Montana, with the cooperation of the Forest Service, are rebuilding the highway through the gorgeous canyon of the Gallatin River north of the park, and within two years will have this work completed. Before this new road is finished we should rebuild our section of the Gallatin Highway and should continue it through to the west approach road. This would mean the construction of from 10 to 12 miles of new road from Grayling Creek to the Madison River.

17. The trail system should be largely extended, and it is particularly important that a new trail be built next year from Trapper Creek, south of Lake Yellowstone around the arms of the lake and over Chicken Ridge to Heart Lake. Likewise, a new trail should be built up Mountain Creek to Eagle Pass. In order that saddle-horse parties may not have to traverse the much used motor roads, new trails should be built on the east side of Lewis River from the south entrance to Lewis Lake and from Turbid Lake to the east boundary by way of Jones Pass.

18. Last, but more important than most of the projects I have mentioned, is the need for taking every possible step for the conservation and protection of the wild animals of the park, and especially the elk herds, which are in constant danger of destruction during the winter months through lack of feed while outside of the boundaries of the park.

YOSEMITE NATIONAL PARK.

W. B. LEWIS, *Superintendent, Yosemite, Calif.*

GENERAL STATEMENT.

The Yosemite National Park, when created by the act of October 1, 1890 (26 Stat., 650), was situated in Tuolumne, Mariposa, Madera, and Mono Counties, Calif., and covered an area of about 1,512 square miles, being 36 miles wide by about 50 miles long. Under the act approved February 7, 1905, entitled "An act to exclude from the Yosemite National Park, Calif., certain lands therein described and to attach and include the said lands in the Sierra Forest Reserve," 542.88 square miles were excluded and 113.62 square miles were added to the park, making a net reduction in area of 429.26 square miles, so that the area, after the passage of the above act, was 1,082.74 square miles, the park being situated in Tuolumne, Mariposa, and Madera Counties. By act of June 11, 1906, entitled "Joint resolution accepting the recession by the State of California of the Yosemite Valley grant and the Mariposa Big Tree Grove, and including the same, together with the fractional sections 5 and 6, township 5 south, range 22 east, Mount Diablo meridian, Calif., within the metes and bounds of the Yosemite National Park, and changing the boundaries thereof," there were added to the park the Yosemite Valley, 48.60 square miles; Mariposa Big Tree Grove, 4 square miles; and a strip lying between the latter and the park proper, 2.13 square miles; and deducted by the change in the southwestern boundary, 13.06 square miles; making a net addition to the area of 41.67 square miles. The present area of the park is 1,124.41 square miles.

PAST, PRESENT, AND FUTURE.

The success of a national park is dependent upon its ability to attract visitors and allowing that any area created as a national park has the necessary natural wonders to make it worthy of such distinction, this ability is governed by its accessibility and the accommodations offered to the visitor after his arrival. In the seventies, with the construction of the Coulterville, Wawona, and Big Oak Flat Roads, the stage coach marked a distinct advance in transportation facilities over the trail horse and a notable increase in travel immediately followed. Each following year saw a slow but steady growth in attendance. In 1908 came the Yosemite Valley Railroad to the park gates, and its connecting link, the El Portal Road, was also opened, thereby providing a shorter and easier route to the valley than had previously existed. Again travel jumped to a new high mark, which gradually raised through the following years to the—what seemed then—enormous figure of more than 16,000 people in 1914. Methods of travel were again revolutionized in 1915 with the advent of the automobile. While it is true the 90 per

cent increase in travel experienced in 1915 can be partially attributed to the incentive given to travel by the Panama-Pacific Exposition in San Francisco in that year, it is a fact that the automobile was responsible for a large percentage of the increase, as our records show. The opening of the Tioga Road, making accessible an area of wonderful high sierra country hitherto almost unknown, also had its share in swelling the total during that season and establishing a new high travel level of more than 31,000 people. With many of the restrictions on automobile travel removed in 1916 even this record was exceeded, as it was again in 1917 when it reached nearly 35,000. In 1918 even with the mind of the Nation so fully occupied as it was with the business of war, the falling off in attendance was only slight, as the total of more than 33,000 visitors attests. But that season's attendance was not a healthy one. It lacked the enthusiasm of that of former years. People rushed into the park and rushed out like the small boy "playing hookey" from school, and as the season advanced it was more and more evident that vacations during war time were contrary to the dictates of clear consciences. So the end-of-the-season indications were not favorable for predictions for the following year.

Following the signing of the armistice, on November 11, 1918, however, prospects began to brighten. Those who had been denied their period of relaxation or who had had only a taste during the war began to plan. Those eager to save during the war were now just as eager to spend, and one object of expenditure in mind was for a vacation trip into mountains. That one objective of such a trip should be Yosemite was given additional incentive when during the past winter the idea was conceived, and the conception converted into action by public-spirited men of California, of securing by popular subscription a fund of $1,000,000 to supplement Federal and State funds already available to build a modern paved highway from Merced to El Portal to connect with the Park highway now under construction from the valley to the El Portal park entrance. The publicity attending this campaign brought Yosemite before the public in a way and to an extent it had never attained before, and undoubtedly was an important factor in the great increase in travel recorded during the season just passed. And the generous distribution of the thousands of $5 certificates sold in this campaign, and which are honored at the park entrances for automobile permits, in lieu of the usual $5 cash entrance fee, practically guarantees a motor travel during each of the next 10 years as great or greater than that experienced during 1919. It is logical to presume therefore that unless the country is again subjected to extraordinary conditions such as those obtaining during the past two years, plans for future development must be based on yearly attendance at least as great as that shown by the past season's figures.

During these periods while travel was increasing from year to year, either gradually or in spurts, development work went on in an effort to keep pace. Hotels were built, enlarged and improved, camps were installed and extended, public utilities, such as water, sewerage, and electric power systems, were installed and enlarged, free public camping grounds were provided, and roads and trails were built and improved. But unfortunately such developments have never quite kept up with the demands of increased travel. This work has always lagged behind, principally because of lack of funds, until now, in this respect, a more or less serious situation confronts us. During the season covered by this report time and again demands on the park operations either could not be met at all or, at best, only partially or inadequately, and if the quite certain demands of the immediate future are to be met at all satisfactorily, a number of items must be given the most careful and serious consideration with view to installation. Sanitary facilities must be not only greatly increased but completely revolutionized, particularly as to methods of sewage disposal; an additional water supply must be developed to replace or supplement the present wholly inadequate supply; existing roads must be improved to meet the new condition of heavier travel and additional roads must be built; the same is true of trails; and of equal importance is the necessity for a first-class modern hotel in Yosemite Valley. In this connection it might also not be amiss to mention the possible necessity in the not distant future of the development of landing fields for aeroplanes. Already two successful landings have been made, and I believe it is not beyond the limits of logical prognostication to predict that before long the aeroplane will be an important factor in park transportation, as well as in park operation, in connection with fire and police patrol. This is an item, at least, that should be kept in mind in planning for future development.

ROADS.

Aside from the work of reconstructing the El Portal Road, the regrading of approximately one-half mile of the Black Springs Road, between the Pohono and El Capitan Bridges, and continuation from time to time during the autumn and spring months of the construction of a new road to Mirror Lake, no permanent improvement work has been done during the past year on any of the 138 miles of Government-owned roads in the park.

Unusual weather conditions and extremely heavy travel necessitated the expenditure of all available road funds to make repairs of damage caused by storms and to carry on the necessary maintenance work to keep the roads in a reasonably passable condition and to prevent irreparable damage resulting from travel.

On May 28 occurred the most destructive storm in the history of the park, when cloudbursts accompanied by electrical displays of unusual severity almost completely inundated the valley, flooding the meadows, washing out roads, threatening bridges, and carrying great masses of débris and depositing them throughout the valley when the water receded. Mountain roads and trails not yet opened for travel and already damaged from the usual winter and spring storms were further damaged, and the results of the work done on those roads and trails already opened or about to be opened to travel were almost completely destroyed, thus making necessary a duplication of the work already done.

While cloudbursts of considerable severity are not unusual during the autumn and spring months, they are, however, as a rule, confined to relatively small areas, generally to a single watershed. This storm, in contrast, was general, and almost equally severe in all parts of the park, and a whole season's work has not sufficed to eliminate its traces and repair all of the damage done.

Of the roads the one to suffer most was the Tioga Road, while the Wawona Road was least affected, although considerable damage was done even here. While immediately before the storm the snow was rapidly disappearing from the Tioga Road, there still remained considerable quantities in the higher stretches, and it was not expected that it would be free much, if any, earlier than usual. The effect of the storm, however, in

addition to washing the road so disastrously, was to remove the snow, thus leaving it free from snow on June 1, at least five weeks earlier than this condition had been known to exist before. Had not the surface of the road been so completely destroyed this condition would have been an agreeable one, as usually our greatest difficulty in getting the road in condition for opening results is from having to cut through snow on the high passes. This advantage was not gained, however, in this instance, as it was a full month before just the worst places could be repaired and made safely passable and the road opened to travel.

Never since the park was opened to automobiles has there been the early season interest exhibited that was displayed during the early spring months. Inquiries for road information were heavy all through March and April, and as soon as the Wawona Road was opened on April 24 travel started in such a volume as to clearly indicate that the season was to be a record-breaking one. Two days later the roads into the Mariposa Grove were opened as far as the Lower Grove, and by the 28th of the month cars were reaching the cabin in the Upper Grove. On May 16 the Big Oak Flat Road was opened, and this was followed by the completion of repairs to the Glacier Point Road on the 28th. The opening of the latter was, however, delayed a few days in order to repair the worst places damaged by the storm on that day. As usual, on account of the high elevations reached, the Tioga Road was the last to open, on July 1.

While it has been an exceedingly difficult and expensive task to maintain the park roads against the terrific wear and tear of the greatly increased automobile travel to which they have been subjected, and in which we have not been any too successful, there is some consolation in knowing that on the whole the roads within the park boundaries have stood up better and are in better condition at the close of the season than those outside of the park.

So long as funds are not available for the permanent work of relocation and permanent grading of the high mountain roads outside of the valley, these roads will have to go through the same program each year. They will be repaired each spring and put in relatively good passable condition, will be subjected to heavy travel, develop ruts and chuck holes, and close the season in bad shape. Until permanent improvements can be made there is no remedy for the situation in sight short of sprinkling, and I am not of the opinion that any of these roads in their present locations and conditions are of sufficient importance to justify expenditures that such an installation would call for.

The roads on the floor of Yosemite Valley are in a quite different category and must be kept in the best possible condition irrespective of expense. However, there can be no doubt but that the expenditure of approximately $1,000 per mile that is now being expended each year in their maintenance, including sprinkling, would be a far better investment if expended for permanent improvement in the way of hard surfacing. With all our expense we can have at best under our present program only a poorly surfaced road, pulverizing rapidly into dust, which, experience seems to indicate, no reasonable amount of sprinkling will keep down. The condition, as well as the expense, will magnify as travel increases, with results that can readily be realized, unless preventive measures in the way of paving are taken in the near future.

TRAILS.

With the exception of those in and around the rim of Yosemite, the trails of the park have been sadly neglected for the past two or three years. During the seasons of 1917 and 1918, when grazing of cattle was permitted on much of the park area, the destruction caused by cattle on the trails was very marked. At the same time the shortage of labor caused by the demands of war did not permit of repair work being done other than on those most used. Maintenance and repair work of trails was, therefore, confined to those trails in and around the valley.

Added to the damage caused by grazing and by lack of even ordinary attention, was the greater damage by the storm on May 28, which in places throughout the park almost completely destroyed them. The result was that at the opening of the travel season last spring all of the more than 600 miles of trails in the park were in a more or less bad condition.

Even during the season just passed labor has not been easy to secure, and particularly has this been true for trail work. Men are not attracted by the isolation of such work or by the inconvenience that must be put up with. It has been possible, therefore, to put only a small force on this work, but much has been accomplished, and before winter all of the main trails south of the Tuolumne River will have been put in a state of good repair, well ditched and drained, and all bridges made safe and substantial.

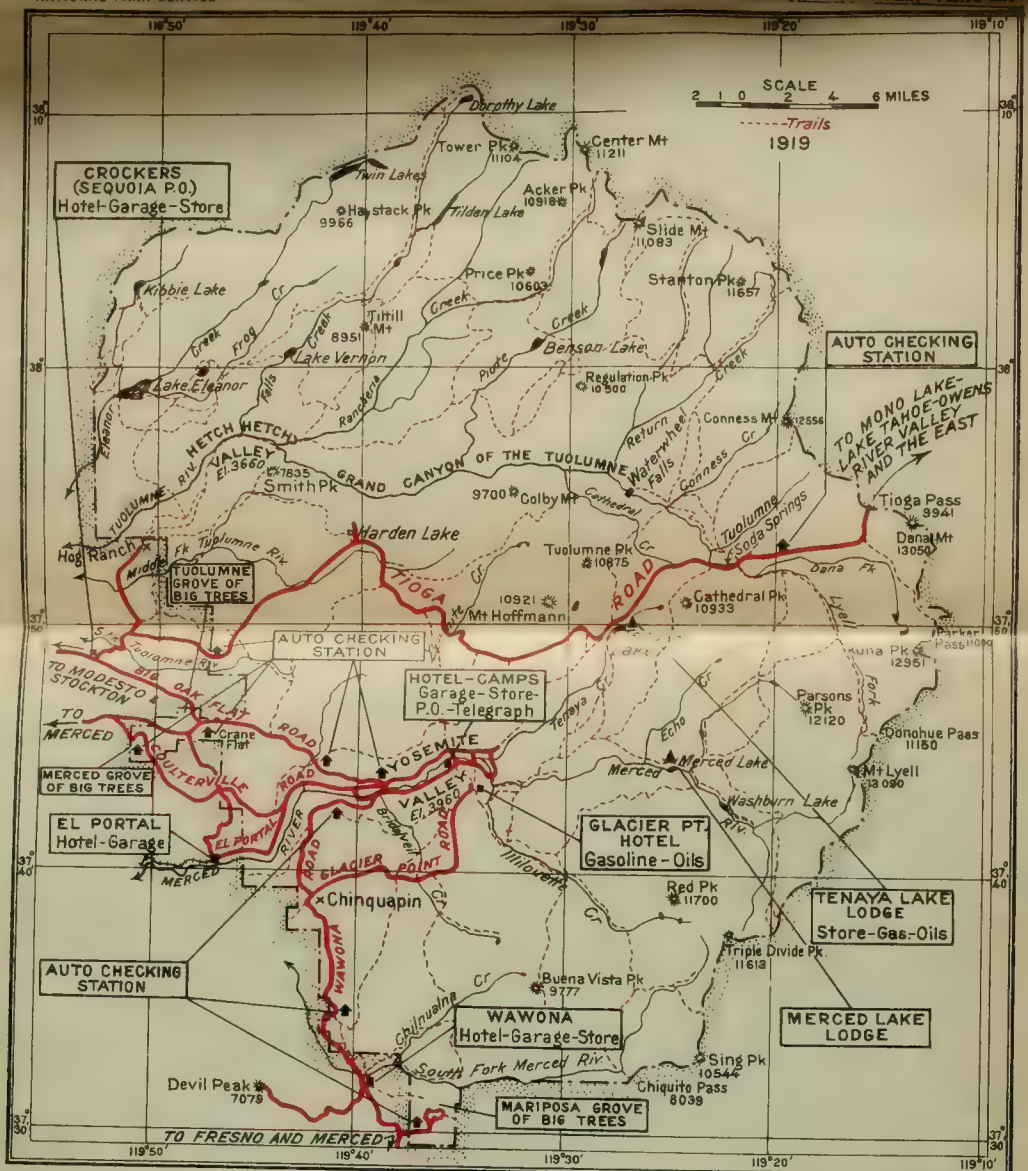
Although I had hoped to be able to similarly repair at least the trunk trails north of the Tuolumne River this year, inability to secure labor has made it necessary to defer this until next season.

Only one piece of trail construction was undertaken this season, this being the Pate Valley Trail from Harden Lake, on the south rim of the Grand Canyon of the Tuolumne River, to Pate Valley, on the floor of the Canyon. This trail passes through country exceedingly difficult for construction, comparing in roughness and general character to that through which the Tenaya Lake Trail climbs out of Yosemite Valley above Mirror Lake. Actual construction on the trail, which will be about 5 miles in length, was begun early in July, but on account of difficulty in securing and keeping men progress has been slow, and it is possible that it can not be entirely finished before next spring.

When completed the Pate Valley Trail will open up an area hitherto practically inaccessible of magnificent scenery and will be one of the most scenic, interesting, and altogether delightful trails in the park. A feature of unusual interest at the end of this trail is the inscription rocks along the walls of the canyon in Pate Valley. Unusual characters and grotesque figures are found painted on the rocks which undoubtedly record something of the Indians who used to inhabit the region. The characters have not as yet been deciphered, but undoubtedly will be soon after the valley becomes accessible.

BUILDINGS.

Since my last report, with the exception of the erection of four employees' cottages as a part of the Lost Arrow housing unit and which are discussed elsewhere in this report, no building has been done except that necessary in connection with road maintenance and the operation of the ranger service.



MAP OF YOSEMITE NATIONAL PARK

ENGRAVED AND PRINTED BY THE U.S. BUREAU OF CAY SURVEY

In connection with the former a small road house and barn was erected at Tenaya Lake on the Tioga Road and to provide adequate accommodations for the automobile checking force a checking station was built at Aspen Valley and one at Tuolumne Meadows on the Tioga Road and one each at Inspiration Point, Chinquapin, and Alder Creek on the Wawona Road. Construction is also in progress of a checking station and road house and barn in the Mariposa Grove of Big Trees, and a road house and barn will be built each at Alder Creek and Eleven Mile Stations on the Wawona Road and at Bridal Veil Creek on the Glacier Point Road.

All of these buildings are inexpensive affairs, but substantial and built from material salvaged from old buildings abandoned elsewhere and covered with sugar-pine shakes cut in the park.

ELECTRICAL SYSTEM.

The electrical system, which consists of a diversion dam across the Merced River about 1 mile below Pohono Bridge, from where water is carried in a 54-inch wood-stave pipe 6,000 feet long to a power house containing two electrical units of 1,000-kilowatt capacity each, driven by turbines operating under an effective head of 330 feet and some 20 miles of transmission lines, was operated 24 hours daily through the entire year.

During this time the plant developed a total of 866,123 kilowatt hours, which was utilized and distributed as follows:

	Kilowatt hours.
Sold for lighting purposes	85,412
Sold for heating purposes	72,611
Sold for cooking purposes	121,641
Sold for power purposes	37,194
Used by Service for all purposes	549,265

Aside from the difficulty experienced with the concrete elbows on the wood-stave pipe line, the entire plant has operated continuously with complete satisfaction.

The fact that the concrete elbows have failed to hold in this case does not, however, condemn their use for conveying water under the conditions existing here. They were built in midwinter at a time when labor was almost impossible to secure and materials had to be transported to the job under the most trying conditions. Undoubtedly faulty materials in the way of unclean sand and gravel found their way into the concrete mixture, which, added to the fact that in spite of every precaution in this direction the concrete appears to have been frozen, with the result that the elbows began to crumble as soon as subjected to pressure. The lower of the three elbows was patched in the spring of 1918 and gave every indication of holding up and did so until August of the current year, when a large leak developed, making necessary its almost complete rebuilding, which is being done at the time this report is being written.

The other two elbows held up from the time of building until the autumn of 1918, when they were almost entirely rebuilt, since which time they have operated with entire satisfaction.

TELEPHONE AND TELEGRAPH SYSTEM.

The telephone system in operation in the park consists of a 150-line switchboard and approximately 220 miles of telephone circuits, 120 miles of which are metallic circuits, the remainder being single-wire grounded lines, and to all of which a maximum of 136 telephones were connected.

During the year a metallic circuit of No. 6 copper wire was built from the exchange to El Portal to meet a similar circuit being built from Merced to El Portal by the Pacific Telephone & Telegraph Co., the entire circuit to be used solely for Yosemite long-distance telephone and telegraph business. These were made necessary by the rapidly increasing long-distance and telegraph business that has been experienced during the past two years since the Service took over the operation of this service in 1917. These lines were to have been completed and connections made by the 1st of July, but the electricians' strike, which occurred in June, prevented the company from completing their section in time to be of assistance during the peak of the season's business. In addition to this improvement in the system some 5 miles of iron metallic circuits were strung throughout the valley to meet the increased demands there.

In spite of the very extensive additions and improvements that have been made during the past three years, the system has not been entirely able to keep pace with the additional demands for increased service. This is particularly true of the long-distance telephone and telegraph service, which has increased during the high travel period more than 400 per cent during the past two years. Prior to the telephone operators' strike in late June, it was utterly impossible to accept the long-distance business offered, the one existing long-distance circuit being entirely inadequate. While the new Yosemite-Merced circuit will undoubtedly relieve the situation materially, still another circuit will without doubt have to be provided within the near future if we are to give the first-class service that the visiting public feels it is entitled to.

Similar but more intense congestion was experienced in the operation of the telegraph service. It was absolutely impossible to accept the business offered by reason of lack of wire capacity. The service was also greatly handicapped by the fact that we are forced to make Merced our transfer point to the Western Union, which office at first refused to accept night letters after 8 p. m. and later in the season 9 p. m. Although we were prepared to accept until midnight, we were prevented from doing so by the refusal of the Western Union to transfer our exchange point to San Francisco, where business could be moved until midnight.

The volume of telegraph business handled rapidly reached the point where an additional operator was required, and in spite of the fact that, in accordance with our agreement with them, the Pacific Telephone & Telegraph Co., furnished a clerk to handle the posting and billing, it was necessary for a period of a month to furnish additional assistance on this part of the work.

To relieve the situation another year, the toll circuit is now being extended to Camp Curry, with the idea of placing an operator at that place to handle both long distance and telegraph. An extension is also being run to Camp Yosemite, where, if present plans for etxension materialize, it may be necessary to handle the situation there in a like manner. The operation of the long distance and telegraph is a profitable one and well worth intensive development.

The following is a summary of the business handled through the telephone exchange and by Morse key during the months of June, July, and August, the month of maximum business, and also the total business for the year:

	June.	July.	August.	Entire year.
Local telephone calls	28,366	30,154	35,720	134,287
Long-distance calls	922	[1] 70	604	2,753
Telegrams handled through switchboard	124	[1] 6	58	888
Telegrams handled by Morse key	2,852	[2] 2,511	1,879	8,735

[1] Operators strike nearly entire month. [2] Wire out of commission July 8 to 19.

WATER SUPPLY.

No change has been made in the water-supply system during the year, the present main supply consisting of two concrete reservoirs, into which spring waters from the talus slopes directly beneath Glacier Point and near Happy Isles are conducted and carried a distance of more than 2 miles to the Yosemite Creek bridge in an 8-inch cast-iron main. Laterals to main points of distribution are of 4-inch cast-iron pipe. In addition to this the pressure line for operation of the old power house at Happy Isles, which is supplied from the Merced River, is connected to the main.

The spring supply is of excellent quality, but insufficient in volume during the dry season, during which time it is supplemented by the river supply, which is very inferior in quality and often carries considerable quantities of sand, silt, and fine gravel, which clog and otherwise damage plumbing fixtures.

From Yosemite Creek bridge a 4-inch main feeds Camp Yosemite, including the swimming tank, baths and laundry, the hospital, and the Government employees' cottages at the old Army camp. Due to insufficient capacity of this 4-inch extension to carry sufficient water to meet the demand of this large unit, difficulty was experienced during the past season such as to make it impossible to maintain enough pressure to supply all parts of the unit at one time. This, besides being intensely inconvenient to users, is dangerous because of the fire hazard it involves. To rectify the situation, therefore, steps are being taken to extend the 8-inch main to include the entire Camp Yosemite unit, so that by the opening of another season this difficulty will be largely, if not entirely, overcome.

SEWERAGE AND SANITATION.

Neither has any change been made in the method of the disposition of sewage other than the extension of the Camp Yosemite system to provide for the effluent of the septic tank to be discharged into a temporary gravel bed instead of allowing the effluent to discharge directly into the river as has been the case in the past. It is doubtful if even this will prevent direct seepage into the river during high water, as the bed is below high-water level and separated from direct contact with the river only by small earth levees, and even should it be successful in this at first, relief can only be temporary, as the bed will shortly become clogged and lose its power of absorption, thus allowing the levees to overflow.

The only solution, as discussed in another part of this report, is the installation of a proper treatment plant.

The method of collecting and burning garbage followed in the valley, while primitive, is effective, and can, without fear of creation of a nuisance, be continued for some time to come, though an incinerator could be utilized to good advantage and is something that should be considered as advisable within the next few years.

MEDICAL SERVICE.

The operation of the Yosemite medical service was placed in the hands of Dr. Frederick L. Stein, of San Francisco, on August 15, 1918, a five-year concession having been granted him from that date, under conditions by which the Government is to furnish and equip the hospital.

Some $3,000 was spent in furnishing and equipping the building, with the result that the medical service is prepared to furnish, in a highly satisfactory manner, almost any kind of medical and surgical treatment that might be demanded or required. The necessity for and the value of this service is indicated by the following figures, which give a summary of its activities during the past year:

Office treatments given	3,437
House calls made	1,604
Hospital cases	60
Accidents reported	135
Operations (minor) performed	22
Operations (major) performed	4
Deaths reported	8

Of the 135 accidents reported, 3 were of such character that permanent injury or even death might have resulted, and 2 were actually fatal.

On May 28, Mr. C. E. Heise, of San Francisco, while returning from Glacier Point by the Short Trail was struck to the ground by lightning. Although it was feared for a time that he had suffered very serious injury, it developed that he was only temporarily stunned, and although severely bruised from his fall was discharged from the hospital after five days' treatment.

On May 30 a Yosemite National Park Co. touring car driven by Mr. J. Kitchen and carrying as passengers Mr. and Mrs. E. S. Ballou and Mrs. Joseph Wing, all of Brookline, Mass., and Mr. and Mrs. E. B. Eden, of Hoboken, N. J., was overturned on the Wawona Road on the Grouse Creek grade. Although all of the occupants suffered from painful bruises and cuts only, it was little short of a miracle that the accident did not have more serious consequences.

Investigation of the accident indicated that the driver tried to pass another car at a high rate of speed, with the result that his own car skidded over the bank. The driver was denied further privilege to drive on the park roads.

On June 28, while working as a lineman on the El Portal telephone line, William Gann, Government employee, was bitten by a rattlesnake. With the assistance of a fellow workman he was brought to the road, a short distance away, and hailing a passing automobile, was hurried to the hospital, where he was given immediate treatment, as a result of which he was completely recovered some three weeks later.

The first fatal accident occurred on the evening of September 26, when Mr. Charles A. Clark, Government employee and road foreman in charge of the El Portal road construction, while driving from El Portal to the valley in a light Ford truck, lost control of the machine and ran off the grade about one-half mile below Pohono Bridge. His body was not discovered until the following morning, when investigation disclosed that death had been instantaneous. Mr. Clark left a wife and three sons, all of the sons being under 16 years of age.

The other fatal accident occurred on August 14, 1919, when Mrs. G. D. French, of Los Angeles, was accidentally drowned while bathing in the Merced River. Mrs. French, with her husband and daughter, had just arrived in the park, and while Mr. French was preparing the camp in Camp 17, the mother and daughter went to the river to bathe. Immediately the mother entered the water she collapsed as though suffering from cramps and disappeared beneath the surface. Assistance arrived too late, and although an hour or more was spent in an effort to resuscitate her the efforts were fruitless, it being impossible to restore respiration.

In addition to these two deaths, six others were reported, the first being that of Mr. George Fiske, the oldest resident of Yosemite Valley. Mr. Fiske was about 85 years of age and had spent about 40 years of his life in Yosemite, where during all this time he conducted a photographic studio. For several years before his death he had been feeble, and of late was inclined to brood over the death of his wife, which had taken place less than a year before. Of his own accord he had lived alone the greater part of the time following the death of his wife, all efforts of his friends and relatives not succeeding in inducing him to leave the place where he had spent so many years of his life.

On the morning of October 20, 1918, he was found on his couch, with the pistol with which he had taken his own life beside him. Letters written some months before, leaving instructions as to the disposal of his effects, indicated that his act had been contemplated for some time.

His remains were buried in the local cemetery by the side of those of his wife, who had preceded him by about nine months.

On November 19, 1918, Mary Higgins, 4-year-old daughter of Mr. and Mrs. Perry Higgins, of El Portal, died in the Yosemite hospital of influenza, and she was followed the next day, November 20, by her father, who succumbed to the same disease.

An unusual case of suicide occurred on March 17, 1919, when Peter Arioli, a laborer on the El Portal Road, arose from his bed in the Arch Rock construction camp about 12.30 a. m. and walked up the road to where dynamite was kept in a locked box, broke open the box, and exploded the half box of 40 per cent dynamite it contained, blowing his body into bits. Investigation of the case showed no apparent motive for the act.

Mr. U. M. Slater, a guest of the Sentinel Hotel, and Mrs. F. Hiltscher, a guest of Camp Yosemite, died on May 26 and August 24, respectively, death resulting in each case from diabetes.

INSECT CONTROL.

A survey of the Yellow, Sugar, and Jeffry pine areas of the park made early in the spring by Park Ranger C. F. Adair developed the fact that these species were exceptionally free from bark beetles, which prey upon them and against which an active control campaign has been carried for the past several years. Accordingly, a minimum of treatment work in these areas was done, three trees being felled and treated in the Big Meadows country, one near Eleven-Mile Station on the Wawona Road, and five on the floor of Yosemite Valley. Subsequent inspections of the same areas by Mr. J. E. Patterson, entomological ranger, Bureau of Entomology, substantiated Ranger Adair's earlier findings, and it is now believed that careful watching of the situation only will be necessary in the future to protect the above-named species from serious attacks.

The condition in the lodgepole areas is not so hopeful; in fact, it is serious. Large areas of this species have been entirely killed from the effects of the mountain-pine beetle during recent years, the worst and most recent being the almost complete destruction of the forests of the Tenaya Basin, which are made up principally of the lodgepole pine (locally, but erroneously, generally referred to as tamarack).

While the seriousness of the situation as it pertained to individual localities has been realized for some time, it has heretofore been believed that a practical and reasonably economical method of treatment would eventually be evolved as a result of the yearly study of the situation by entomologists by which it would be possible to confine the activities of the beetle to the areas already attacked and prevent invasion of other stands. That this possibility is now considered doubtful is evidenced from the reports of Mr. Patterson on the results of his intensive study of the situation made during the past season.

It is of interest to note that while the actual killing of the trees is due to the attacks of the bark beetle, the attacks of this insect are invariably preceded by attacks on the foliage by an altogether different insect, the needle miner. The latter attacks the needles of the lodgepole, first discoloring the foliage and eventually causing complete defoliation. Curiously enough these attacks, although they may continue for several years, seldom are directly responsible for their death. They do, however, sap the vitality of the trees which, so weakened, fall easy prey to the bark beetle, which follows in due course.

The special importance attached to the situation as it now stands lies in the fact that the heretofore exceptionally vigorous lodgepole stand in and around the Tuolumne Meadows is now threatened with destruction similar to that suffered by the stands in the Cathedral Creek and Tenaya Lake Basins. Although the needle miner has been prevalent in the Tuolumne watershed for many years the forests have recovered from each of the successive attacks with relatively little, if any, apparent damage having been done, and until the autumn of 1918 were able to resist invasion of the bark beetle. At that time, however, a foothold was gained in the western and southern part of the basin, and this year's investigations indicate that the infestation is rapidly becoming general.

Mr. J. M. Miller, assistant forest entomologist, under whose supervision the studies and investigations made by Mr. Patterson were carried on, presents the following summary of the condition as it existed in August last, a reading of which will clearly show what results might be expected within the near future unless in the meantime some effective method of control is found:

"Forest-insect epidemics present a serious situation in the lodgepole-pine forests of the Tuolumne watershed and two small tributaries of the Merced (Tenaya Basin and Snow Creek). About 30,000 acres of mature or inferior lodgepole forests are involved, where the trees have been attacked by two virulent insect pests.

"All of the stand between the elevations of 7,000 and 9,000 feet has been repeatedly defoliated by a needle miner. Where this condition has persisted for 10 years or more the forests have become weakened and injured by the defoliation to an extent that their protection against bark-beetle attacks does not now appear advisable.

"A study of the habits of the needle miner and a survey of its distribution within the park will be completed this season. Methods of controlling this pest have not been determined. Considering the extensive forest conditions under which control must be applied it is doubtful if artificial measures can be found which are practicable.

"On approximately one-half of the area affected by the defoliation the forests are being rapidly killed by the mountain-pine beetle.

"In Virginia canyon, where the needle-miner epidemic subsided prior to 1913 from natural agencies, the attacks of the bark beetle were brought under control by artificial measures, and the expenditure well warranted by the results obtained.

"In the Cathedral and Tenaya Creek Basins control measures were only temporarily effective in stands which were badly damaged by defoliation and where the needle-miner epidemic persisted. Approximately 75 per cent of the forests in these two basins are now dead, and it is expected that within a few years only a few surviving trees will be found near meadows and more favorable sites.

"In the Tuolumne Meadows only a very small per cent of the trees have as yet been killed by the bark beetle. However, an outbreak within this extensive forest is now to be expected. The entire stand within the limits of the needle-miner epidemic has been so damaged by defoliation that from a distance it resembles a dead forest, although an examination of the cambium shows that the majority of the trees are still alive. That they may ultimately recover, even though the bark beetle does not attack them, is doubtful. Such recovery can only be accomplished after a long period of years.

"In view of the condition of the stand, the expenditure of any sum of money to protect the defoliated lodgepole stand in the Tuolumne Basin against bark-beetle attacks does not appear to be advisable. It is suggested that some attention be given to a silvicultural study to determine the possibility of replacing the dead lodgepole stands with species of trees better suited to park purposes.

"It is not considered that the infestation in the lodgepole pine areas threatens the forests of other species of pine outside of the affected areas. The control work which has been carried on in other parts of the park in the yellow pine, Jeffrey pine, and sugar pine have met with a considerable measure of success."

MOSQUITO CONTROL.

At the request of the Service, officers of the United States Public Health Service were assigned by the bureau to supervise the problem of control measures against the mosquito nuisance in Yosemite Valley. Early in May Maj. J. S. Geiger and Lieut. L. D. Mars went over the ground carefully, submitted recommendations, and Park Ranger Adair was placed in immediate charge of the field work. All stagnant pools were sprayed frequently with oil, and most unexpected satisfactory results were obtained. Treatment was continued until June 18, by which time breeding had ceased entirely.

The work demonstrated fully that the mosquito nuisance can be effectively controlled and that, if continued from year to year, the public will be relieved from the annoyance suffered in the past from this source.

TIMBER OPERATIONS.

The city and county of San Francisco, in connection with their development of the Hetch Hetchy project, continued the operation of their sawmill on the city's Canyon Ranch property, the mill being supplied with timber cut from park lands involved in the so-called Dudley exchange consummated in 1917.

In this operation they cut approximately 2,000,000 feet b. m. of lumber, thereby completing the cutting of timber involved in the exchange. In August the mill at Canyon Ranch was dismantled, and the entire structure, including machinery, was moved to the city's hog-ranch property, which lies just outside of the park limits. Here the mill is being reassembled, and the timber on this property, comprising 120 acres, will now be cut and shipped to Hetch Hetchy for use in connection with the construction of the Hetch Hetchy Dam, contract for the construction of which was let to the Utah Construction Co., of Salt Lake City, Utah, in August last.

In the southern part of the park the Yosemite Lumber Co. continued logging operations on park lands involved in the recent timber and land exchange by which title to all of the land holdings of the company reverts to the United States.

Since the beginning of the season's operations in March, the company have cut and shipped to their mill at Merced Falls 14,590,406 feet b. m. of logs on 3,245 cars, an average of 4,496 feet b. m. per car. In this operation they cut over about 360 acres of land, all of which lie within the boundaries of the park and located in sections 3, 4, 9, 10, 15, and 16, township 4 south, range 21 east, M. D. M.

FOREST FIRES.

In spite of the unusual dryness of the entire country in and around the park, the number of forest fires reported during the past season is less than that of any of the three previous seasons. A total of 10 fires only have been reported, only two of which, however, gave any serious trouble. One of these was set by lightning on May 28, about 3 miles west of the Chilnaulna Ranger Station, and although fire lines were established on account of the brushy nature of the country in which it burned, it smouldered for nearly three months, and at times breaking over the guard made necessary the sending

of fire-fighting parties back to it on three occasions. In spite of the fact that it burned over considerable area, being a ground fire, comparatively little damage was done to the live timber.

The other bad fire was started on July 28 outside of the park on the south side of the Merced River just below El Portal. It was of incendiary origin, having been set by an Italian named Jim Montega, who had shortly before been expelled from the park on account of his exceedingly quarrelsome attitude toward everyone with whom he came in contact. He was arrested by Forest Ranger Robinson, of the Stanislaus National Forest, and later sent to the State Insane Asylum, where he had been confined for more than a year on a previous occasion.

The fire rapidly gained ground and, traveling toward the park line more than a mile away, was not gotten under control until it had burned in places as much as a quarter of a mile over the line. Practically no damage was done to park timber, the fire inside of the park being confined principally to lands owned by the Yosemite Lumber Co.

FISH AND GAME.

As a result of the quite extensive stocking of the streams during the past few years by means of young fry furnished by the California State Fish and Game Commission and by transplanting of larger-sized fish from one stream to another, not only has fishing improved in many of the waters of the park that were stocked in the early years of Federal administration, but the range of good fishing grounds has been considerably extended. With the output of the State experimental hatchery available, approximately 400,000 young fry have been planted during the past season. While the planting of these was confined largely to the Merced River in Yosemite Valley and to Tenaya Lake, some 150,000 were distributed in the Ten Lakes, Babcock and Emerick Lakes, the Tuolumne Meadow waters, and the various streams along the Tioga and Wawona Roads.

Deer, bear, and bird life seem to continue plentiful, while ranger reports seem to indicate that those animals that naturally prey upon them are on the decrease.

EXPERIMENTAL FISH HATCHERY IN YOSEMITE VALLEY.

Early last spring the California State Fish and Game Commission installed an experimental hatchery on the site of their proposed permanent building near Happy Isles, with view to testing out the water of the Merced River for fish-culture purposes before going ahead with the permanent structure. Four hundred thousand eggs of the Eastern Brook trout, the Rainbow trout, the Steelhead and the Black Spotted trout, were shipped in and placed in the 10 troughs provided for hatching.

The results have been most gratifying, the young fry having developed with unusual rapidity, clearly indicating the suitability of the water. All of the fry have been planted in the waters of the park, the greater number being released in the Merced River in Yosemite Valley, with the idea of supplying good fishing at that point where the greatest number of people congregate. A large number was also placed in Lake Tenaya, where heretofore there has been practically nothing in the way of trout.

Unfortunately, now that the Federal Government has leased land to the State for a building site and experiment has clearly demonstrated the suitability of the water for fish-culture purposes, the governor has withdrawn his favor from the project, and the probability of erecting a permanent building for hatchery purposes is now clouded in uncertainty. It is certainly to be hoped that the governor will withdraw his objections, for the operation of a hatchery in the park for the purpose of supplying fry with which to keep the park waters adequately stocked with fish would benefit not only park interests, but would benefit the State, as the bulk of the visitors to the park are from California, and there is no place in the State where the work of the State Fish and Game Commission could be so readily brought to the attention of the people as here, where a hatchery would be visited by probably not less than 40,000 people annually.

RANGER SERVICE.

A maximum of 21 rangers were engaged during the season in the handling of traffic, checking automobiles, mountain patroling, fire fighting, and general police work. That, in spite of the tremendous increase in traffic and the accompanying increased tendency toward an increasing number of violations, order was satisfactorily maintained speaks well for the force and indicates that what was lacking in numbers was made up in alertness and conscientiousness.

I believe a high-class ranger service to be one of the chief assets of a park organization, and the varied duties the members have to perform, together with the close contact they have to keep with the public, makes it one of the most difficult departments to satisfactorily build up and hold together. The successful ranger must be honest, courteous, and patient and at the same time firm, equal to emergencies, and of good judgment. He must be impartial to all, cognizant of his responsibilities, and loyal to the Service he represents. To find men in whom all of these qualifications are happily combined is not easy, but when once found they should be encouraged in every possible way, for when all is said and done it is the ranger, the man who deals more directly with the public than any other, that reflects the attitude of the Service he represents.

INFORMATION BUREAU.

The operation of the bureau of information in the superintendent's office was continued, and during the season more than 18,000 campers were registered and assigned to camping space in the public camps. In addition to the registering and assigning to camps of this number, it is estimated that not far from 90 per cent of all park visitors other than those accommodated in the public camps called upon this bureau at one time or another during their stay in the park for information. The bureau has become an essential part of the park organization upon which the public, assured of securing authentic and impartial information, has come to depend not only for information but for assistance of all kinds.

In conjunction with the bureau was operated a branch office of the California State Automobile Association, where road information of all kinds was given out by a representative of the association. Association maps were also distributed to all requesting them whether members of the association or not. No charge was, of course, made for this service.

PROHIBITION OF DOGS.

After an effort lasting through three seasons to regulate without absolute prohibition the bringing of dogs into the park, the idea was abandoned and the regulation absolutely prohibiting them promulgated. Although extensive publicity was given this regulation both before and during the season, occasionally persons accompanied by dogs arrived at the park entrance maintaining ignorance of the rule. While little sympathy was had for these people as a rule, there were instances where concessions had to be made. This was true principally on the Tioga Road, where, had the regulation been rigidly applied, the motorist bound for points on the far side of the Sierras would have been forced to suffer undue hardship.

I am very much in favor of continuing this regulation in effect. In spite of every dog owner's belief that his dog can readily distinguish between predatory and harmless animals and will attack only the former, the fact is almost any dog will run game, and game that has been run by dogs will seek the far places where dogs are not found and will therefore be lost as an attraction to the tourist along the beaten track. The delight that park visitors enjoy in seeing deer or bear or other wild animals along the roads and trails is sufficient reason for prohibiting dogs, even if no other reason existed.

FIRST AEROPLANE ARRIVES.

After much discussion as to the feasibility of the proposition and considerable negotiation with the officials at Mather Field, the commanding officer of the field finally consented to permit an attempt to be made with an Army plane to negotiate an aeroplane landing on the floor of Yosemite Valley. Accordingly on the morning of May 27 Lieut. J. S. Krull, flight commander at Mather Field, in a Curtiss biplane equipped with a 150-horsepower Hispano-Suiza motor, dropped down into the valley from the direction of Half Dome and made a perfect landing on the landing field that had been prepared for the purpose. On the following morning Lieut. Krull effected an equally successful take-off, and, although a forced landing, due to gasoline trouble, was necessary at Mormon Bar on the outgoing trip, he arrived safely at Merced after having made the round trip of about 150 miles in less than two hours of actual flying time and with the distinction of having been the pilot of the first aeroplane to land in Yosemite Valley.

Lieut. Krull's experience demonstrated that the hazards that were considered to be lurking along the rim of the valley in the way of dangerous air currents do not exist, and that, so far as this phase of the situation is concerned, a flight into the valley is little, if any, more dangerous than elsewhere.

This initial flight was followed by another on August 5, when Lieut. Earl B. Nonbig, also of Mather Field, landed in the valley after the first nonstop flight from San Francisco, in which he negotiated the distance of approximately 180 miles in 2 hours and 40 minutes.

There seems no reason why, after complete aviation maps have been prepared of the surrounding mountain country, showing all of the possible landing places (and there are many of the countless high mountain meadows suitable for this), this method of transportation into the valley will not become popular, and I believe that before very long definite preparations must be made to provide proper landing places, not only in Yosemite Valley but in other places of interest in the park, such as Tuolumne Meadows and Lake Tenaya.

I believe also that the feasibility of the use of the aeroplane for fire patrol from the valley is one that should be immediately considered.

TRAVEL.

The tremendous increase in travel recorded during the season has been mentioned so frequently elsewhere in this report that it is needless to comment further on this phase of park activity other than to give a summary of the total, and the following tables have been prepared to show this, together with its distribution, as means employed in getting to the park:

Automobiles and motor cycles.

Entrance.[1]	Road.	Number of automobiles.	Number of people.	Number of motor cycles.	Number of people.
SEASON 1918.					
Alder Creek	Wawona	3,834	14,037	45	62
Crane Flat	Big Oak Flat	1,904	6,633	11	19
Merced Grove	Coulterville	37	123		
Aspen Valley	Tioga	822	2,574	2	3
Tioga Pass	do	970	3,162		
Yosemite	Various	54	170	3	4
Total		7,621	26,699	61	88
SEASON 1919.					
Alder Creek	Wawona	6,545	23,471	93	137
Crane Flat	Big Oak Flat	1,291	4,832	18	31
Merced Grove	Coulterville	86	296		
Aspen Valley	Tioga	265	890	2	4
Tioga Pass	do	1,690	5,648	3	5
Yosemite	Various	161	502	5	11
Returns through Aspen Valley from Crane Flat.		796	2,767		
Returns through Crane Flat from Aspen Valley.		1,275	4,494		
Total		12,109	42,900	121	188

[1] Return cars through Aspen Valley from Crane Flat and through Crane Flat from Aspen Valley, included in totals for each station in 1918 figures.

Other means of transportation.

	1918	1919
Travel by auto stages other than via El Portal Road	2,330	3,237
Travel via Yosemite Valley R. R. and El Portal Road	3,894	11,043
Travel by wagon, horseback, or on foot	516	994
Total travel other than by private cars and motor cycles	6,740	15,274

Summary.

	1918	1919
Travel by private automobiles	26,669	42,900
Travel by motorcycles	88	188
Travel by auto stages	2,330	3,237
Travel by wagons, etc	516	994
Travel by Yosemite Valley R. R.	3,894	11,043
Total	33,527	58,362

CONCESSIONS.

The following list of concessioners operated in the park during the season of 1919:

Name.	For what granted.	Expiration.	Annual rent.
E. N. Baxter	Sale of curios, photos, etc	Dec. 31, 1919	$75.00
Mrs. John Degnan	Delicatessen store	do	[1] 250.00
H. C. Best	Studio, photos, etc	do	[1] 250.00
A. C. Pillsbury	do	do	[1] 250.00
J. T. Boysen	do	do	[1] 250.00
D. J. Foley	do	do	[1] 250.00
Dr. F. L. Stein	Hospital	Aug. 15, 1923	[2] 200.00
Yosemite Stage & Turnpike Co.	Automobile stage line	Dec. 31, 1931	100.00
Trustees of Yosemite school district.	Lease of site for schoolhouse	Dec. 31, 1936	None.
Curry Camping Co	Public camp	Dec. 31, 1921	[3] 2,000.00
Yosemite National Park Co.[4]	Hotels, chalets, inns, camps, transportation service, store, and dairy.	Dec. 31, 1938	([5])
Do	Permit to use barracks, livery barns, and Sentinel Hotel.	Dec. 31, 1919	([5])

[1] Permit fee fixed at 4 per cent of gross revenue, $250 minimum.
[2] Permit fee fixed at 4 per cent of gross revenues, $200 minimum.
[3] Permit fee fixed at 4 per cent of gross revenues, $2,000 minimum.
[4] Yosemite National Park Co., operating under the name of Yosemite National Park Co., George J. Dougherty, receiver, during the season of 1919.
[5] 22½ per cent of operating profits after deduction of 6 per cent on physical investment.

Lease, special-use, and water-power permits under act of Feb. 7, 1905, segregating lands from Yosemite National Park and placing same in Sierra and Stanislaus National Forests.

Period of concession.	Name of concessioner and privilege granted.	Compensation exacted.
Indeterminate period.	Yosemite Valley R. R. Co. Lease dated Sept. 5, 1905, grants to company right to construct and operate electric railway along Merced River to park boundary. Rate may be readjusted and fixed by President of United States after expiration of first 3 years under lease.	[1] $1,000
Do	Yosemite Valley R. R. Co. Special-use permit issued by Forest Service, approved Feb. 7, 1908, by S. J. Flintham, acting forest supervisor, authorizes construction of diverting dam, pipe line, and water tank for conveying water from a spring and storing in tank for use in operating company's electric road. All timber cut to be paid for under timber-settlement regulations of Forest Service.	

[1] Per annum, on demand of Secretary of Interior.

Lease special use, and water-power permits under act of Feb. 7, 1905, etc.—Continued.

Period of concession.	Name of concessioner and privilege granted.	Compensation exacted.
Indeterminate period.	Yosémite Lumber Co. Special-use permit, approved by district forester, Forest Service, June 27, 1911, for right to construct logging railroad and inclined tramway in Sierra National Forest, for removal of timber adjacent to company's road. All timber used to be paid for at rate to be fixed by forest supervisor, Sierra National Forest, which shall correspond with prevailing stumpage rates charged on said national forest when timber is cut. Stipulations signed by company June 20, 1911, and approved June 27, 1911, by District Forester F. E. Olmstead, accompanying the permit, require annual payment (outside of charge for live and dead timber, standing and down, cut, damaged, killed, or destroyed along right of way, title to which at time of cutting is in United States) of $1,200 on demand therefor being made by the Secretary of the Interior.	[1, 2] $1,200
Do.....	Yosemite Lumber Co. Special-use permit, approved Nov. 22, 1911, by E. G. Dudley, acting forest supervisor, Sierra National Forest (Forest Service), authorizes construction and operation of telephone line along inclined tramway and logging railroad in Sierra National Forest.	[3]
Do.....	Yosemite Lumber Co. Special-use permit, approved Nov. 22, 1911, by E. G. Dudley, acting forest supervisor, Sierra National Forest (Forest Service), covers right of way for and authorizes construction and operation of pipe line about one-half mile long from spring on lands segregated from park (in Sierra National Forest) for purpose of piping water from company's inclined tramway and logging railroad to supply boilers of steam hoisting plant, etc.	[3] 10
50 years [4].....	Merced River Electric Co. (project "A"), final water-power permit granted by Agriculture Department (Forest Service) Apr. 11, 1911, running for 50 years, unless sooner revoked by that department, for right of way for diverting dam and power conduit in Stanislaus National Forest. Annual charge over lands segregated from park based on 1,460 horsepower, at 10 cents per horsepower for first year, with increase of 10 cents per horsepower each succeeding year until maximum charge of $1 per horsepower is reached, annual charge thereafter being at latter rate. Stipulations signed by officers of company Mar. 21, 1911 (and accompanying above permit), provided that payment upon above basis should be made annually in advance from Jan. 1, 1912, permit, however, being approved Apr. 11, 1911, and first payment, $146, being made June 7, 1911; this payment was applied on 1911 calendar year. Amount due for fourth year, 1914, 1,460 horsepower, at 40 cents; horsepower capacity subject to readjustment after expiration tenth year.	584

[1] Per annum, on demand of Secretary of Interior.
[2] Value of all timber cut and paid for on right of way (payment of $406.56 made May 3, 1912, and $334.56 made Oct. 3, 1912), $741.12.
[3] Per annum, in advance.
[4] Unless sooner revoked by the Department of Agriculture.

EXCERPT FROM ACT OF CONGRESS APPROVED DECEMBER 19, 1913, GRANTING TO THE CITY AND COUNTY OF SAN FRANCISCO CERTAIN RIGHTS OF WAY IN, OVER, AND THROUGH CERTAIN PUBLIC LANDS IN THE YOSEMITE NATIONAL PARK AND STANISLAUS NATIONAL FOREST ADJACENT THERETO.

Section 7 of the above act provides that for and in consideration of the grant by the United States as provided for in this act, the said grantee shall assign free of cost to the United States all roads and trails built under the provisions hereof; and further, after the expiration of 5 years from the passage of this act the grantee shall pay to the United States the sum of $15,600 annually for a period of 10 years, beginning with the expiration of the 5-year period before mentioned and for the next 10 years following $20,000 annually, and for the remainder of the term of the grant shall, unless in the discretion of Congress the annual charge shall be increased or diminished, pay the sum of $30,000 annually, said sums to be paid on the 1st day of July of each year. Until otherwise provided by Congress, said sums shall be kept in a separate fund by the United States, to be applied to the building and maintenance of roads and trails and other improvements in Yosemite National Park and other national parks in the State of California. The Secretary of the Interior shall designate the uses to be made of sums paid under the provisions of this section under the conditions specified herein.

Section 4 of the act provides that no timber shall be taken, cut, or destroyed within Yosemite Park or Stanislaus Forest except as such may be actually necessary to construct, repair, and operate its reservoirs, dams, power plants, water-power and electric works, and other structures mentioned in the act, but that no timber shall be cut or removed from lands outside of the right of way until designated by Secretary of Interior or Secretary of Agriculture, and the grantee shall pay the full value of all timber and wood cut, injured, or destroyed on or adjacent to any of the rights of way and lands, as required by either of said officers: *Provided*, That no timber shall be cut by the grantee in Yosemite Park except from land to be submerged or which constitutes an actual obstruction to the right or rights of way or to any road or trail provided for in the act.

PATENTED LANDS AND GRAZING.

With the consummation of the exchange agreement between the department and the Yosemite Lumber Co., whereby the Government secures title to all of that company's land holdings in the park, there was left still in private hands approximately 10,000 acres of private lands within the confines of the reservation. Of this about 6,560 acres

are owned in relatively large blocks and located in the western part of the park west of the divide between the Yosemite Creek watershed and the watershed of the Middle Fork of the Tuolumne River and south of the Grand Canyon of the Tuolumne River, the remaining 3,440 acres consisting of comparatively small isolated holdings scattered through the eastern and northern part.

The larger acreage mentioned has long been in part owned and in part controlled as to grazing privileges by one man, who has used the advantage as an argument for special grazing privileges on adjoining park lands. The result has been contention between him and the park authorities since the creation of the park, and even yet no satisfactory arrangement has been determined upon. The existence of this situation is not only a serious handicap to efficient administration of that part of the park but contradicts the general grazing policy of the park, which, since the war, stipulates that grazing will not be allowed. The Service is, therefore, placed in a position where criticism can be (and is to some extent) directed toward it on the grounds of inconsistency in directing its policy.

As a final solution to the problem I would suggest and recommend a change in the park boundaries. The area above described comprises roughly 30,000 acres, approximately 20 per cent of which is privately owned and contains little of scenic value for park purposes aside from the Tuolumne and Merced Groves of Big Trees, both of which groves are small, little visited, and not in any way to be compared with the Mariposa Grove, which alone of the Big Tree Groves has always been associated with Yosemite. Doubtless even if they were eliminated from the park public sentiment would see to it that they are never destroyed.

On the other hand, much of the area is suitable for grazing purposes, and in or out of the park the bulk of timber on the private lands will eventually be cut, thus leaving the area even less desirable for park purposes than it now is.

East of the present eastern park boundary and on the other side of the Sierras is an area of superbly scenic mountain country, which by all rights should be included within the park limits. In fact, it did fall within the original boundaries of the park, but I am not familiar with the reasons for its elimination at the time the boundaries were revised. It is my understanding that this area has little, if any, value other than as a scenic wonderland of lakes, mountains, and peculiar volcanic formations, and should rightly be preserved as a recreational area only. I have in mind the Thousand Island Lake, Rush Creek, and the Devil Postpile country, which I believe should again be included in and become a part of the Yosemite National Park.

I believe the advantages to be gained all around by such a revision of the park lines can not but be apparent to all interested, and I urgently recommend that immediate steps be taken to secure legislation authorizing the change.

EXTENSIVE INTERBUREAU COOPERATION.

The Service's policy of evoking the aid of other Government bureaus in working out the various problems where special scientific or technical advice and assistance are required has been applied extensively and with the most beneficial results.

Under the supervision of a mosquito expert from the United States Public Health Service a highly successful campaign was carried on against the mosquito pest, which has always been such a nuisance. From the same Service an engineer was assigned to make a study and report on the sanitary and sewage situation and to make recommendations for the installation of a suitable disposal plant.

The United States Geological Survey continued the work of gauging the stream flow of the Merced River and its main tributaries in Yosemite Valley, and also furnished a topographic engineer to make a detailed survey of the floor of the valley.

The Bureau of Entomology has been represented continuously through the season by a trained entomological ranger, continuing the studies and supervising the actual control measures inaugurated in 1914 against the various species of forest insects attacking the park forests. The work of this bureau has been highly successful in the sugar, yellow, and Jeffry pine belts, but the final results of treatment in the lodge-pole areas are still undetermined and uncertain.

When it became evident last winter that, unless some preventive measures were taken, the scenic value of the road leading from the Tioga Road to Hog Ranch, on the main route from Yosemite to Hetch Hetchy, would be destroyed as a result of logging operations being carried on in that area, the Forest Service, at the request of the Park Service, cooperated, to the end that timber reservations are now being made along either side of the road to serve as a protective screen.

It is also of interest to note that at our request the Army Air Service authorized a trial flight into Yosemite Valley, which resulted in demonstrating the practicability of air transportation into the valley.

The ready cooperation of every one of these Government bureaus is not only of value economically, but the opportunity it offers for the interchange of ideas between different governmental organizations can not but be beneficial to the public in a broader way, in that it broadens the field and scope of each of the bureaus affected, and hence is bound to increase their efficiency to the public.

FEDERAL JURISDICTION.

In April, 1919, the governor of California signed the bill, previously passed by both houses of the State legislature, granting exclusive jurisdiction over Yosemite National Park, the full text of which is as follows:

" Section 1. Exclusive jurisdiction shall be, and the same is hereby, ceded to the United States over and within all of the territory which is now or may hereafter be included in those several tracts of land in the State of California set aside and dedicated for park purposes by the United States as 'Yosemite National Park,' 'Sequoia National Park,' and 'General Grant National Park,' respectively, saving, however, to the State of California the right to serve civil or criminal process within the limits of the aforesaid parks in suits or prosecutions for or on account of rights acquired, obligations incurred, or crimes committed in said State outside of said parks; and saving, further, to the said State the right to tax persons and corporations, their franchises, and property on the lands included in said parks (and the right to fix and collect license fees for fishing in

said parks; and saving also to the persons residing in any of said parks now or hereafter the right to vote at all elections held within the county or counties in which said parks are situated): *Provided, however*, That jurisdiction shall not vest until the United States, through the proper officer, notifies the State of California that they assume police jurisdiction over said parks."

Only those who have had to do intimately with the actual enforcement of park regulations where no definite procedure is defined, as has been the case in past years, can realize what the granting of Federal jurisdiction means as an aid to satisfactory park administration. Lacking the machinery at hand for the effective prosecution of cases of violations of the park regulations, all sorts of makeshift procedure and action have had to be devised, and it is indeed fortunate that our authority in specific cases has not been seriously questioned more often than it has. It is to be hoped that Congress will accept the grant of jurisdiction without undue delay, so that the necessary Federal machinery may be installed before another season arrives.

NATIVE SONS OF THE GOLDEN WEST CONVENTION.

On June 1 the forty-second Grand Parlor of the Order of Native Sons of the Golden West was convened at the Government Pavilion in Yosemite Valley, Grand President William F. Toomey, of Fresno, presiding. From then until June 5 alternate days were given over to business sessions and visiting points of interest in and around the valley.

Four hundred and fifty-six delegates of the order were present at the sessions, and with their families and other members of the order the total number visiting the park by reason of the convention was placed at about 1,800 people.

LE CONTE MEMORIAL LECTURES.

The University of California, through its university extension division, offered in June and July the first series of the Le Conte Memorial lectures. These lectures, instituted in honor of the naturalist and geologist, Joseph Le Conte, a member of the faculty of the University of California for 30 years and an ardent lover of Yosemite and the Sierras, will henceforth be an annual event in Yosemite.

The series of lectures completed during the past summer were scientific in character and yet delivered in the language of the layman. They covered a variety of subjects and were delivered by speakers of recognized standing in their various fields.

Prof. W. L. Jepson, of the department of botany, University of California, in three well selected lectures discussed "The Origin and Distribution of Buttercups in Yosemite," "The Biology of the Chaparral," and "The Ancestry of the Yosemite Pines and Sequoias."

Prof. William F. Bade, lecturer and literary executor of John Muir, gave in his talks a graphic account of the life of John Muir, his thought and study and knowledge of the Sierra region, and his theory of the forces creating the Yosemite Valley. In his last address, given as the oration of the day on July 4, Prof. Bade told of Muir's long fight for the creation of national parks and of his cooperation with Theodore Roosevelt in securing favorable legislation.

The next three lectures of the series were delivered by Dr. F. Emile Matthes, geologist, United States Geological Survey, on the origins of Yosemite Valley and of the domes of the Yosemite region and on the part glaciation played in their development. The extraordinary topographic features of Yosemite Valley arouse in every visitor the desire to know something of the forces that were engaged in carving them, and Dr. Matthes' lectures were therefore received with a very high degree of enthusiasm.

The last lectures of the series also touched a popular note, and Prof. A. L. Kroeber, of the department of anthropology, University of California, was listened to with the closest interest in all three of his talks on the Indians of the Sierra and Yosemite and on the legends and folklore of Yosemite.

All of these lectures were highly educational and delivered as they were in the simplest of language met with an unexpected response. All but three of the series were delivered in the open in front of the Le Conte Memorial Lodge, and the average attendance was probably in excess of 250 people.

SIERRA CLUB OUTING.

The Sierra Club outing, which was scheduled for last year, but which was postponed on account of the war, took place from July 11 to August 10. Headquarters were made on the Sierra Club property in Tuolumne Meadows, where 175 members of the club met and from where they covered a large area of the high Sierras. Early in August the entire party made a trip into the Ten Lakes country, utilizing the new Ten Lakes Trail built last year. From here trips were made to various points of scenic interest along the south rim of the Tuolumne Canyon. Mr. William E. Colby, president of the club, was in personal charge of the outing, and it is needless to say that he saw to it that each one left with a deeper appreciation of the wonders of the mountains and canyons of Yosemite than when he started.

On the Ten Lakes trip Mr. Colby accompanied General Foreman Sovulewski over the route of the Pate Valley Trail and at the same time, together with Mr. Sovulewski, inspected the route of the proposed continuation of the Water Wheel Falls Trail and the proposed Piute Creek Trail discussed elsewhere in this report, making valuable suggestions as to the location of each, which will be given consideration when the construction of these trails is undertaken.

LIBERTY LOAN SUBSCRIPTION.

In the fourth Liberty loan, in which Yosemite's quota was placed at $10,000, a total of $15,050 was subscribed, of which park employees subscribed $10,200, while in the Victory loan, in which Yosemite's quota was $7,500, a total of $23,100 was subscribed, of which $15,400 was subscribed by park employees. In the former a total of 94 employees subscribed an average of approximately $109.50 each, while in the latter a total of 122 employees subscribed an average of approximately $126.25.

NOTABLE IMPROVEMENTS.

Since my last report more than 3 miles more of grading has been completed on the El Portal Road. Considering the very unsatisfactory labor situation, the exceedingly difficult country through which the road passes, and the necessity for keeping the road open to traffic while construction was under way, very favorable progress has been made during the past year. Constructed to a full width of 20 feet, of easy grades and safe curves, and the outer edge protected with a substantial parapet of cut granite, the road presents a pleasing appearance and has given delight to hundreds of motorists who made use of it during the past summer.

The interest aroused by the campaign instituted in May for the sale of certificates for the construction of the Yosemite Highway from Merced to El Portal created no little desire on the part of purchasers of certificates to see what was being done by the Service in the way of providing the necessary connecting link to the valley. Accordingly, from the beginning of the season the El Portal Road has been traveled extensively, first out of curiosity, but later in the light of an additional Yosemite attraction for its scenic beauty. Probably not less than 10,000 automobiles have passed over the finished portion during the past summer.

It is hoped to have the grading of the road completed to the park line and an attractive entrance gate erected at that point before winter. There will still remain to be done a considerable amount of finishing work, such as ditching and the laying of some 4 miles of parapet along the upper part of the road. All of this work should be completed by the opening of another season, and all will be ready for paving by the end of the current fiscal year.

The most satisfying improvement made in the park in several years was the erection of the new Sentinel Bridge over the Merced River, near Yosemite Village, during last autumn and winter. For years, on account of the exceedingly unsafe condition of the old Sentinel Bridge, it was necessary to avoid its use for heavy loads. Being the most important river crossing in the valley, much time, effort, and money was lost and inconvenience suffered through making detours to avoid it.

Unlike the old, the new bridge is an attractive and appropriate structure, and calls forth the most favorable comments from park visitors. Constructed of reinforced concrete and native cut granite, in addition to being attractive, is substantial and capable of carrying loads up to 20 tons, and should meet all requirements for years to come.

With view to adding variety of design to the main bridges of the valley, distinctive designs have been or are being made for each of the other bridges under construction or proposed. The new Sentinel Bridge of the cantilever type and constructed of concrete with massive stone piers is being followed by the new Stoneman Bridge, now under construction, a beam structure built entirely of concrete. The design proposed for the Yosemite Creek Bridge, which should be erected next year, is that of a stone arch of native granite, while a flat arch of concrete is proposed to replace the existing timber structure at Happy Isles. This latter bridge is in such a precarious condition that it is doubtful whether it will survive next spring's high water period, and will undoubtedly have to be replaced next season.

There had long been a crying need for a footbridge across the Merced River connecting the village with the north side of the river, and it was, indeed, a satisfaction to have funds available for its construction last autumn. The structure is 220 feet long, is built in four spans resting on concrete piers. The superstructure is of yellow-pine logs, with rustic railings of cedar poles. All of the timber used was cut in the forests on the floor of the valley. The result is architecturally attractive and at the same time utilitarian.

The imperative need for more cottages for the accommodation of Government employees made necessary the erection of four small buildings for this purpose. These were built near the site of the old Lost Arrow Camp, and mark the beginning of the development of a complete residence unit on that site. All were built in accordance with a definite plan that has been drawn up for the development of a complete housing scheme.

CRITICISMS AND RECOMMENDATIONS.

As previously stated, development of necessary accommodations in Yosemite to meet public requirements have never kept pace with the growing demand. As a matter of fact the tendency has been to lose a little more ground in this direction each year. And it must be admitted that the Government has been equally remiss in this respect with the concessionaire. The result is that now entering upon a new and greater travel era, as this year's activities very forcibly predict, both Government and concessionaire are called upon to make an extraordinary effort to catch up with the procession.

Sewage and sanitation.—The most glaring lack in the way of the most necessary provisions in Yosemite is the almost total lack of sewerage facilities. During the months of May, June, and July the average daily population of Yosemite Valley was approximately 4,000 people, with a maximum population of approximately 5,000. This number was concentrated in an area of not to exceed three-fourths of 1 square mile, a concentration greater than that of the residence section of an ordinary city. Of this number, approximately 50 per cent were accommodated in the free public camps and the remainder in the hotels and hotel camps. When it is considered that nowhere in Yosemite Valley is there a sewage installation that even approximates adequacy, and that even in cases where some effort has been made to install a system, it has been subjected over relatively long periods every season to loads not less than 100 per cent in excess of its capacity. In the two such instances that exist the result has been that raw sewage has been discharged directly into the river, thereby endangering the health of the many thousands of park visitors who utilize the river for bathing, and, in spite of warnings to the contrary, for cooking and drinking purposes.

For instance, Camp Curry sewage is taken care of by septic-tank installation of the Ashley type. While the system itself is of an approved type, during the high-water period, which lasts from three to four weeks during the height of the travel season and during which time the soil has no capacity for absorption, the plant fails absolutely and the bulk of the discharge finds it way over the surface of the ground directly to the river. Accordingly, during this period, practically the entire sewage discharge from a community of 1,000 people, the average daily house count of the camp, goes to the pollution of the river waters.

At Camp Yosemite the condition is even worse. Here sewage is disposed of through a so-called septic tank, which is little more than an ordinary cesspool, the overflow of which discharges directly into the river less than 200 feet away. The tank was originally constructed to provide for the Army barracks and officers' quarters and built with a maximum capacity of probably not more than 200 people. It is now the sole means of sewage disposal for a camp that during three months of the year has an average house count of not less than 200 people, with a maximum of nearly 700, and, in addition this receives the discharge from a large swimming tank and laundry. In other words, it is carrying a load from 300 to 400 per cent in excess of that for which it was designed and installed and nearly 100 per cent of all of the sewage received by it goes directly into the river with little, if any, purification.

The total area of the free public camping grounds is probably about three-fourth of a square mile. The average population of this area during the months of May, June, and July of this year was probably in excess of 1,500 people, and that during the period from June 15 to July 15 not far from, if not quite, 2,000. The maximum was just under 2,500 on July 5, and the total number of park visitors making use of the public camping grounds during the entire season was approximately 18,000. The concentration of people on portions of these areas was really greater than the above figures indicate, as the tendency is for campers to crowd along the river banks, thereby decreasing considerably the area actually used for camping purposes and at the same time greatly increasing the problem of sewage disposal. These units, with a population equal to that of a small city and a concentration still greater, are provided only with the primitive dry-earth privies, which have to be moved from two to three or even four times during every season, and which, in addition to offering the least convenience to users, saturate the soil with pollution that sooner or later finds its way to the river.

That these conditions exist is most unfortunate, and it is not pleasant to cogitate on what might happen in the way of a serious epidemic within the valley itself or in any of the settlements along the river outside of the park that are dependent upon the river for their supply of drinking water if these conditions are allowed to continue.

To rectify the situation, the installation of a modern sewage disposal plant of sufficient capacity to provide not only for the maximum population already recorded but for probable future increase, is the only logical solution, and I most urgently recommend that nothing be left undone to secure funds for its installation next year.

Commenting on the need for a complete revolution in sewage disposal methods in Yosemite Valley, Capt. R. E. Tarbett, associate sanitary engineer, United States Public Health Service, who was assigned at your request by that bureau, writes as follows:

"With the increasing number of people visiting the valley each year the danger of importation of typhoid and other intestinal diseases, either through people entering in the early stages of the disease or by carriers of the diseases, will increase at a rate more or less inversely proportional to the increased population rate.

"With the present methods of waste-water disposal an increase in the fly prevalence is to be expected, due to the increased food material about the camps, and with the increased fly prevalence will come the increased danger of the spread of intestinal diseases through the fly as a vector.

"Increased population will also increase the pollution in the river, thereby offering additional sources of danger through the use of the river water for drinking purposes within the valley and along its course below. In this connection it should be borne in mind that to the average person a clear, cool water is considered a good water. Even with a considerable amount of pollution, the Merced River will fulfill the requirements as to appearance and temperature.

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"That up to the present time the valley has been relatively free from the so-called filth-borne diseases is remarkable. That it will continue to be free in the future under the existing conditions is very improbable. Conditions are now existing which should not be allowed to exist in public camping grounds patronized to the extent which the camps in this valley are patronized.

"if it is the intention to advocate the use of this park as a summer resort, such steps as are necessary to safeguard the health and comfort of the people visiting the park should be taken immediately."

The California State Board of Health, representatives of which have from time to time investigated sanitary conditions in Yosemite Valley, is equally positive in its belief that nothing but the installation of a complete sewage-treatment plant can be considered as a satisfactory safeguard to either the people visiting the park or those who are dependent on the waters of the Merced River farther down its course where communities are not able to provide themselves with the necessary purification plants whereby to purify the water for domestic uses. In fact, so insistent is this bureau in its desire for an immediate improvement in conditions that communications received from that source and now on file in this office intimate that unless the situation is soon rectified it will be necessary to take steps to limit travel to the park to the point where present sewage facilities will suffice to handle sewage disposal without pollution of the river waters. Such action would be disastrous, as it would mean the curtailment of travel to less than half of that recorded for the past season.

There was a time when to camp out was to disregard the necessity for protection of the mountain lakes and streams from pollution, and campers paid little, if any, attention to what filth or waste was deposited into the streams so long as this was not done immediately upstream from their own camping place, believing that clear, running water purified itself almost immediately through aeration, and no thought was given to the user of the water farther down the stream. Experience has, however, shown that disease-carrying germs can be transported long distances, and that pollution near the source of domestic water supplies generally means practically equal pollution at the point of use. As the Federal Government should be the first to consider the protection of the public health and the last to disregard or deny unsatisfactory sanitary conditions where the Government is directly responsible, it behooves the Park Service to do all in its power to impress upon Congress the necessity for immediate action in this instance where there is such abundant evidence of the existence of a dangerous and wholly unsatisfactory situation.

Equally unsatisfactory sanitary conditions, although on a smaller scale, exist as a result of improper handling of sewage disposal and other waste in the operation of the

outside lodges and the Glacier Point Hotel. The conditions are unusually bad at the latter place, where the sewage from a modern first-class hotel is allowed to overflow from a very inadequate cesspool over the surface of the soil on the very bank of the stream which parallels for about one-half of its length the Ledge Trail over which hundreds of people travel to and fro between the valley and Glacier Point. It is indeed annoying and aggravating to the "hiker," hot, tired, and thirsty, to see, at points where the trail is crossed by this stream of apparently pure mountain water, signs staring him in the face and warning him not to drink, and it is no wonder he criticizes the Service for allowing such a condition to exist. Considering the relatively small expenditure necessary to correct the condition—not more than $6,000—and in view of the apparently profitable season that the operators have just completed, I feel that I am justified in recommending that the Service demand that a suitable sewage-treatment plant be installed before the hotel is allowed to open for another season.

Administration building.—The present building, in which is located the park administrative offices, is the result of joining together two old abandoned buildings inherited from the State administration and to which was added later a second story. In the earlier stages of Federal administration under the Army, the upper floor was used as the quarters of the Army officer in charge, while the ground floor was utilized for the park offices. It is a ramshackle affair, the foundations of which have unevenly settled and rotted away, leaving the floors warped and uneven, infested with vermin impossible to eliminate, inadequately ventilated and lighted, and above all wholly lacking in space for the necessary office work for effective administration.

Fully 90 per cent of the visitors to the park have occasion to call at administration headquarters at least once if not several times during their stay. If they leave at all favorably impressed with Government's administration of the park it is better than an even bet that it is not because of the agreeable surroundings. If it is advisable to build first-class roads and trails and provide high-class hotel and camp accommodations for the public and to provide comfortable living quarters (and all of this is advisable without question), it is equally important that adequate space within reasonably attractive, comfortable, and sanitary walls, and in which the entire organization would take pride, should be provided for those who carry on the work of administration instead of having to wrestle with the intolerable conditions which now exist and which can but have the effect of indifference in their work.

Plans already drawn for such a building include space for the telephone exchange, telegraph office, information bureau, and a museum. This latter is considered of exceptional importance from a public viewpoint. Here it is proposed eventually to have on exhibition specimens of the flora and fauna of the park, a considerable collection of which, through the efforts of Chief Ranger F. S. Townsley, already exists and only awaits provision of suitable space for exhibition.

Roads.—As Yosemite has lagged in making necessary provisions for adequately handling the sewage situation, so has it failed, although to a lesser degree, in keeping apace with the demands for better road conditions. The park roads as they now exist were originally built with no thought of modern demands of automobile travel. In their construction the line of least resistance was followed, no attention being paid to grades or curves or width, with the result that, with the exception of those roads on the floor of Yosemite Valley, none approach the requirements of the automobile. Neither, with the exception of the El Portal and the Valley Roads, have sufficient funds been supplied with which to improve them materially, the roads remaining essentially as when first constructed. These roads as originally built are not susceptible to easy modification to meet modern needs and satisfactory improvement can only be attained by their relocation and practically complete reconstruction. This can, of course, only be done through the medium of large expenditures, but if comments of many of those who have motored over them can be in any way considered as a criterion of general public feeling, I am sure the public would not be averse to carrying the extra burden, large as it might appear in the aggregate, although exceedingly small when reckoned on a per capita basis.

Assurance of the long-hoped-for Yosemite Highway, connecting Merced with El Portal by an all-year paved highway, brings us face to face with the serious problem of meeting the extensive demands that its completion will bring. The question of the moment is how are we going to handle the enormous increase of automobile travel that will result? The answer seems to be by paving the El Portal Road and the roads on the floor of Yosemite Valley and by the early construction of the proposed Nevada Falls-Lake Tenaya Road.

Experience has shown that ordinary dirt or gravel surfaced roads can not stand the strain of heavy automobile travel, and no reasonable amount of maintenance work and sprinkling will prevent rapid deterioration of the surface into chuck holes or prevent the dust nuisance. Both are suffered extensively under present conditions and the large amounts of money it is necessary to expend on their maintenance each year is a weighty argument for permanent improvement, which can be obtained only by paving. With travel doubled or tripled, as will be the case following the completion of the Yosemite Highway, the necessity of such improvement is ever so much more vital.

Again the opening of a paved all-year highway of easy grades into the valley with the accompanying increase of travel is bound to cause congestion in the valley, where by virtue of its formation and the lack of adequate roads leading to other parts of the park distribution of the population will be difficult. To meet this condition an outlet to the back country is essential, and the logical route for such an outlet is in the direction of the Tioga Road. Surveys completed during the past summer indicate that a road of easy grades up the Merced River over Vernal and Nevada Falls and across to Tenaya Lake via Forsythe Pass, to connect with the Tioga Road, is feasible, and its construction is recommended as an important item of adequate park development.

The construction of this road is also of exceeding importance as a link in the Yosemite-Lake Tahoe route. At present Lake Tenaya on this route is 61 miles by road from Yosemite, and the bulk of the trip is through country uninteresting from a scenic standpoint and over roads exceedingly difficult of negotiation by the average automobile. The proposed new road would, on the other hand, place Lake Tenaya within 22 miles of the valley, and the trip would be made over a road of easy grades, entirely safe in every respect, and the scenic attractions that would be afforded the traveler are unexcelled.

Bridges.—Along with the roads logically comes the consideration of bridges, as a road without adequate bridges is a failure. Prior to last winter but one of the eight bridges spanning the Merced River and its tributary streams in Yosemite Valley was of such con-

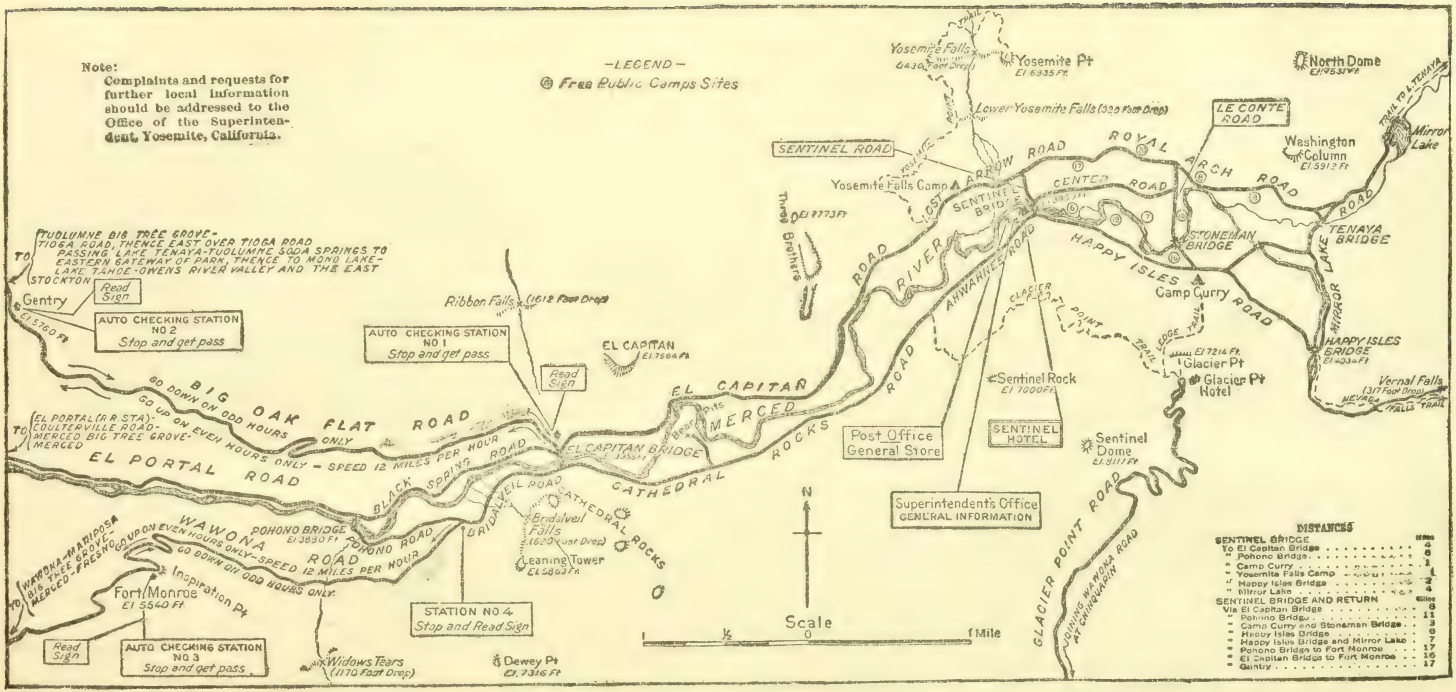


FIG. 3.—AUTOMOBILE GUIDE MAP SHOWING ROADS IN YOSEMITE VALLEY, YOSEMITE NATIONAL PARK.

struction or in such condition as to carry loads in excess of 4 or 5 tons with any assurance of safety. In order to handle ordinary freight traffic and road sprinkling equipment it was necessary to give them additional support in the way of under-supporting posts or cribs. The supports were constantly being carried out by high water, leaving the structures in a dangerous condition, with the result that their use for heavy hauling was constantly being interfered with and at the same time considerable amounts of money were being expended on them without any permanent results. Such a condition is of course unsatisfactory, and the great step toward permanent rectification of the situation taken in the construction of the very attractive and substantial new Sentinel and Stoneman Bridges, erected since my last report, will, I hope, be followed by the replacement of other inadequate existing structures of nearly equal importance by substantial, appropriate structures. I have in mind principally the Yosemite Creek and the Happy Isles Bridges as being of first importance.

Trails.—After two or three years, during which interest in trail trips to the back country has been manifestly on the decline, it is agreeable to note that the past season has seen a revival of interest in the trail as a means of touring the park, and from the numbers of parties that have availed themselves of the opportunities to take a real camping trip into the far places not reached by the automobile, it seems logical to presume that the interest will continue to increase and that the high Sierras will again come into their own as a mecca for the real campers and mountain lovers.

One of the finest bits of rugged mountain scenery in the park, or even in the entire range of the Sierras, is found in and along the Grand Canyon of the Tuolumne River, but because of lack of trails much of the region has been heretofore almost inaccessible. By the construction in 1917 of the trail from the White Cascades to the upper Water Wheel Falls and that of the trail from Yosemite Creek Bridge on the Tioga Road to Ten Lakes on the south rim of the canyon in 1918 important links were provided in what should be the final trail system to open up the entire area, and the completion of the trail now under construction from Harden Lake along the south wall of the canyon to Pate Valley, in the floor of the Canyon, will supply an additional link of equal importance. In order, however, to complete the system by which it is proposed to make the Grand Canyon of the Tuolumne region equally accessible from Yosemite Valley and from the Lake Tenaya and Tuolumne Meadows country, and at the same time effectively connect up the northern part of the park with the southern part, it will be necessary to continue the Water Wheel Falls trail down the canyon to Pate Valley, a distance of about 12 miles, to join the Pate Valley trail, now under construction, and to construct another trail from Pate Valley up Piute Creek to join with the Pleasant Valley and Rogers Lake trail, a distance of about 5 miles. I consider this an important improvement of the park-trail system and one that I trust funds can be supplied for during the next year.

Additional water supply necessary.—The unusually dry season just passed, combined with a totally unexpected demand for water, has demonstrated without question that no amount of improvement of the present spring-water supply will make it adequate to meet future needs. So completely was this supply exhausted that even the talus slope immediately below the present catchment reservoirs, where surface indications have always before given evidence of the feasibility of supplementing the springs by corralling the run-off at some lower elevation for pumping back into the springs proper or into storage tanks, showed as early as the middle of August no signs of water and the idea of further development here has been completely abandoned.

It will therefore be necessary to seek another source for the development of a permanent supply, it being the intention, of course, to utilize, as in the past, the spring supply during the early part of the season and to develop the new supply for late season needs only. This new supply must be obtained either from the Merced River or from Illilouette Creek, and as both streams are subject to floods, during which periods considerable silt is carried in suspension, in either case it will be necessary to provide settling tanks in order to clarify the water.

Free public camps.—The popularity of the free public camping grounds maintained in Yosemite Valley by the Service continues to increase with the increase of travel. Not only are they being utilized more and more by the transient park visitor who comes to camp for a few days or a week, but greater advantage is being taken of these facilities by families who have become convinced that this is an ideal way to spend the entire summer. Numbers of such camps have stood all summer long, and in some instances a considerable amount of competition has been stirred up by the various owners, each trying to outdo the other in having the most complete outfit.

Aside from the lack of adequate sanitary facilities above noted, there are, however, a number of other facilities lacking which should be furnished if the free public camping grounds are to meet the public demands that further increase of travel is going to bring.

At present there are no roads worthy of the name in any of the camping grounds, and as the bulk of the camping is done by automobilists something should be done to make the grounds more accessible to automobiles and at the same time provide well-defined roads that can be systematically sprinkled, thereby eliminating the dust nuisance which during the past summer in some of the camps has been so annoying.

There is also a great demand that the public camps be lighted. This is a reasonable demand, as it is exceedingly difficult for the hundreds of campers who utilize the camps at one time to find their way about after dark, and with the surplus of electric power available the service could be given with practically no cost to the Government other than the cost of installation.

Although I believe there is sufficient space in the camping grounds now operated for at least 4,000 people without undue congestion if properly distributed, under our present method of handling the assigning of campers congestion actually takes place even when only half of that number is accommodated. This is due to the fact that there is a very decided tendency to concentrate along the river bank or in some particularly advantageous location, leaving practically unoccupied equally large and suitable camping areas elsewhere. I believe the ultimate solution of this problem is to designate in each camp certain well-defined camp sites, number them, and then assign campers accordingly, not allowing camping elsewhere than on those definite sites. This will add much to the work of operation of the Service, as it will necessitate the keeping of arrival and departure sheets, but I believe it will be the only solution.

Tuolumne Meadows and Mariposa Grove.—Tuolumne Meadows is the center of all back-country travel. The meadows and river offer ideal conditions for camping, and campers are rapidly taking advantage of the excellent opportunities offered. From July

1, the date of opening of the Tioga Road, to about the middle of August an average of not less than 200 campers were scattered about the meadows, and it is estimated that the maximum number reached was about 400. Such extensive use of this area for camping purposes without some sanitary facilities and without supervision can not safely be continued longer or serious pollution of the Tuolumne River will result. The time has come when it is necessary to lay out camp grounds and assign campers to designated camps as in Yosemite Valley and to provide toilets and supervise the disposition of garbage and other camp waste. This problem is now being studied with a view to handling the situation in this way next season.

The demand for camping space near the Mariposa Grove of big trees is one that I believe should be given consideration, and a suitable site has been selected just below the Fallen Monarch and near the new Ranger station, where it is recommended camping be allowed. Lack of space and the demand that I am sure will follow the announcement that camping will be permitted may make it necessary to set a limit on the time campers will be allowed to stay.

Hotel and hotel-camp facilities.—As early as the first of June the park faced a shortage in hotel and hotel-camp accommodations, and before the end of the month it was necessary to turn people away in large numbers, and the city offices of the operating companies were instructed to refuse reservations until the situation was relieved. For several weeks every bit of available space was occupied, numbers of persons being accommodated in the schoolhouse, in warehouses, and by Government employees in their quarters, and as all available camping equipment was in use additional facilities could not be provided in the public camps which were accommodating over 100 per cent more than ever before. It was necessary for this office to issue notices warning prospective visitors not to come unless they had their own camping equipment or unless they had confirmed reservations.

It is not possible to estimate the number of people who were turned back as a result of these conditions, but I believe that if there had been sufficient available accommodations the maximum number of people in the park at one time would have been nearer 8,000 than 5,000, as was actually the case. At any rate it is evident that more hotel and hotel-camp accommodations must be provided another year if we are not to face a repetition of this year's congestion, and I believe that instead of having this class of accommodation for 2,500 as is now the case, there should be room to handle not less than 5,000 people. The most crying need along this line is, of course, a first-class hotel capable of accommodating not less than 400 guests to replace the altogether inadequate and impossible Sentinel Hotel, but Yosemite Camp should also be extended and additional facilities provided at Glacier Point. The decision to abandon the lodge at Lake Tenaya and reestablish it at Tuolumne Meadows is, I believe, a wise move, as the possibilities for healthy development are undoubtedly better in the latter location.

SEQUOIA AND GENERAL GRANT NATIONAL PARKS.

WALTER FRY, Superintendent, Three Rivers, Calif.

GENERAL STATEMENT.*

The Sequoia National Park was created by act of Congress of September 25, 1890 (26 Stat., 478), and act of October 1, 1890 (26 Stat., 650). The General Grant National Park was created by act of Congress of October 1, 1890 (26 Stat., 650). Exclusive jurisdiction of the territory so set aside was ceded to the United States by act of legislature of the State of California approved April 15, 1919. Exclusive jurisdiction of these reservations has not yet been accepted by act of Congress.

The Sequoia National Park is located in Tulare County, Calif. It has an area of 161,597 acres and ranges in altitude from 1,100 to 11,900 feet. The General Grant National Park is located one-half in Tulare County and one-half in Fresno County, Calif. It has an area of 2,536 acres and ranges in altitude from 5,250 to 7,631 feet. The Sequoia National Park derives its name and much of its interest from the presence of many large groves of "big trees" (*Sequoia washingtoniana*), and the General Grant National Park was thus named by reason of the "General Grant tree," so widely known for its size and beauty. Both of these parks are situated in the southern portion of California, about midway between the cities of San Francisco and Los Angeles, on the western slope of the Sierra Nevada, and contain an aggregation of the most magnificent mountain scenery to be found on the continent. The forests within their borders contain the greatest groves of the oldest and largest trees in the world.

Park headquarters are located at Giant Forest in Sequoia National Park, 19 miles inside the park line from the west entrance, during the summer season, and at a point 2 miles east of Three Rivers, 4 miles outside the park line from south entrance during remainder of the year. A telephone system connects both these headquarters with General Grant Park, long-distance service at Three Rivers, and the various outpost stations throughout the reservations. A civilian force of 11 men as park rangers was employed in Sequoia Park and of 3 men in General Grant Park during the season of heavy traffic. Ten of these men were assigned to various outposts throughout the parks, and four men made it their special duty to care for the welfare of the traveling public and to see that sanitary measures and grazing regulations were properly enforced. The distance from Giant Forest headquarters to General Grant Park by road is 95 miles and by trail 32 miles, and from the Three Rivers headquarters by road is 63 miles and by trail 34 miles. Lemon Cove, nearest railroad station from Giant Forest headquarters, is 40 miles, and from Three Rivers headquarters 10 miles.

WEATHER.

The winter season of 1918–19 was mainly noteworthy for ample but rather poorly distributed rain and snowfall. The rainfall season started during the month of October and ended during the month of May, with a seasonal total of 14.28 inches. A plentiful supply of snow fell on the higher mountains, but the snow did not pack as usual and during the warm rains which fell on the snow in the latter part of May all was melted at one time, thus leaving the mountainous region practically bare of snow. Some snow

remained on the northern slopes of Alta, Silliman, and Vandever Mountains in Sequoia Park. As a result of these abnormal weather conditions the water run-off in all the park streams was lower during the summer and autumn months than at any time noted since the park records have been kept. No rains fell at the main tourist camps during the open park season. The atmosphere was at all times cool and pleasant.

TRAVEL.

California is the wonderland of the motorist. Its scenic grandeur of mountain and sea is now attracting the attention of motorists from all parts of the United States, and touring the national parks was the greatest outdoor sport of the year in California.

There was appreciable increase in the number of people visiting the Sequoia and General Grant National Parks this season. Much of the credit for the influx is due to the completion of the newly paved highways which lead up to the parks and the advertising sent out, which paints the truthful glories of the scenic wonders embraced in our national parks.

The parks were officially opened this season between the dates of May 24 and October 10, on the former of which all park concessioners commenced operations. Owing to the high elevations where the main tourist camps are situated in the parks, there was but little travel to them prior to the date of their formal opening, other than to that section designated as the Elk Park, which is situated along the Middle Fork of the Kaweah River at a much lower elevation in Sequoia Park.

The following table shows the total travel to the parks for the year ending October 12, 1919:

Sequoia National Park.

Sequoia National Park Stage Co	292
Making park trips with private transportation:	
With automobiles, paid and complimentary, and on those roads where no fee is exacted	19,300
With automobiles, second trip	4,822
With other private transportation, as wagon, horse, and afoot	6,029
Grand total	30,443
Travel by different entrances:	
Giant Forest Road	13,217
Elk Park Road	10,550
Mineral King Road	4,551
Trails, all sources	2,125
Total	30,443

Private automobile travel.

	Automobiles.	People.
Entering via Giant Forest Road	1,707	11,901
Entering via Elk Park Road	1,451	8,715
Entering via Mineral King Road	694	3,506
Total	3,852	[1] 24,122

[1] Includes 4,822 people making park visit in second-trip automobiles, which are not counted.

A fee of $2.50 was charged for tickets of passage on the Giant Forest Road, which were good for the entire season, but no fee was exacted for passage on the Mineral King County Road or the Elk Park Road, which was constructed by the Mount Whitney Power & Electric Co. Complimentary tickets were issued to officials of adjoining States or counties and to officials of the Federal Government visiting the park.

General Grant National Park.

The aggregate number of persons making trips to General Grant National Park during the season of 1919 was as follows:

Kings River Stage and Transportation Co	174
Making trips with private transportation:	
With automobiles, paid and complimentary	16,437
With automobiles, second trip	3,707
With other transportation, as wagon, horse, and afoot	1,256
Grand total	21,574
Travel by different entrances:	
Stephens Grade Road	19,349
Millwood Road	1,561
Lake Road	192
Trails, all sources	472
Total	21,574

Private automobile travel.

	Automobiles.	People.
Entering via Stephens Grade Road	3,170	18,801
Entering via Millwood Road	185	1,305
Entering via Lake Road	11	38
Total	3,366	[1] 20,144

[1] Includes 3,707 people making park visit in second-trip automobiles, which are not counted.

A fee of 50 cents was charged for tickets of passage, which were good for the entire season. Complimentary tickets were issued to officials of adjoining States or counties, and to officials of the Federal Government visiting the park.

ROADS.

Public sentiment in California is solidly behind extensive highway building. With a total appropriation of $70,000,000 for good roads, California has exceeded every other State in good-roads building. Besides this, the counties of the State have voted many millions of dollars for good roads. In this both Tulare and Fresno Counties, in which the Sequoia and General Grant National Parks are situated, have been foremost, and within the next two years there is every prospect of developing paved highways to the parks. This will do away with the dirt roads and reduce the excessive grades.

Construction of 30 miles of paved roads between Visalia and Three Rivers on the Tulare County highway system leading to Sequoia Park has already been completed, at a cost of $300,000, and there is now made available by reason of the State bond election, which was carried on July 1, 1919, the sum of $300,000 for reconstructing and paving the remaining 14 miles of road between Three Rivers and the park. This road is intended to make the park more accessible to motorists and tourists and is generally known as the Whitney-to-the-Sea highway. There is also incorporated in this same bond issue $100,000 for the purpose of extending the Kings River Canyon Road on into the famous Kings River Canyon, a distance of some 20 miles. This road connects up with the General Grant Park roads at the north park entrance and will be of material benefit to the park traffic, as it is the only road leading to the region and all traffic passing thereover will necessarily have to go through the park.

As the result of what is now being done in California in matter of constructing good highways leading up to the parks, it is evident, in order to meet the ever-growing demands of the traveling public, that two important sections of new roads be constructed in Sequoia Park just as soon as funds can be procured for the purpose. These two proposed roads, with respect to their names and locations, are as follows:

1. *Middle Fork-Giant Forest Road—10 miles.*—This road to lead out from the Middle Fork Road at Hospital Rock and connect up with the Giant Forest Road at a point near Giant Forest. If constructed, this road will be the means of opening up to automobile travel one of the more scenic portions of the park, do away with all steep grades now to encounter, furnish entire separate route for travel to Giant Forest, and, by reason of the fact that the road will be located on the south side of the mountain slope where snow never lies during winter, travel can pass thereover to and from the Giant Forest camp at all seasons of the year, thus permitting opportunity of maintaining Giant Forest an open camp the year round, as against five months under existing conditions.

2. *Sequoia-General Grant Park Road—10½ miles.*—Between Mable Fork River crossing and Clover Creek at north park boundary. This important section of road should by all means be completed in the very near future, as by such procedure many additional camp sites will be opened up to the public, and the road will form a connecting link between Sequoia and General Grant Parks and the Kings River region over which automobiles can pass on one of the most scenic mountain drives known on the American continent.

The Giant Forest Road within the Sequoia Park, 30 miles in length, was put in excellent condition for travel early in the spring, and has remained in fairly good condition throughout the season. It has required but little additional attention. The Elk Park Road, 10 miles in length, was repaired by the Mount Whitney Power & Electric Co. early in the season and remained in good condition thereafter. The Mineral King Road within the park, 11 miles in length, was repaired by the county of Tulare early in the season, and the county has since kept a small crew of men at work on the road.

General Grant Park.—There are 13½ miles of roads within the park, all of which were put in good condition for travel early in the season, but the heavy traffic made necessary the doing of some additional work on the roads during the summer season.

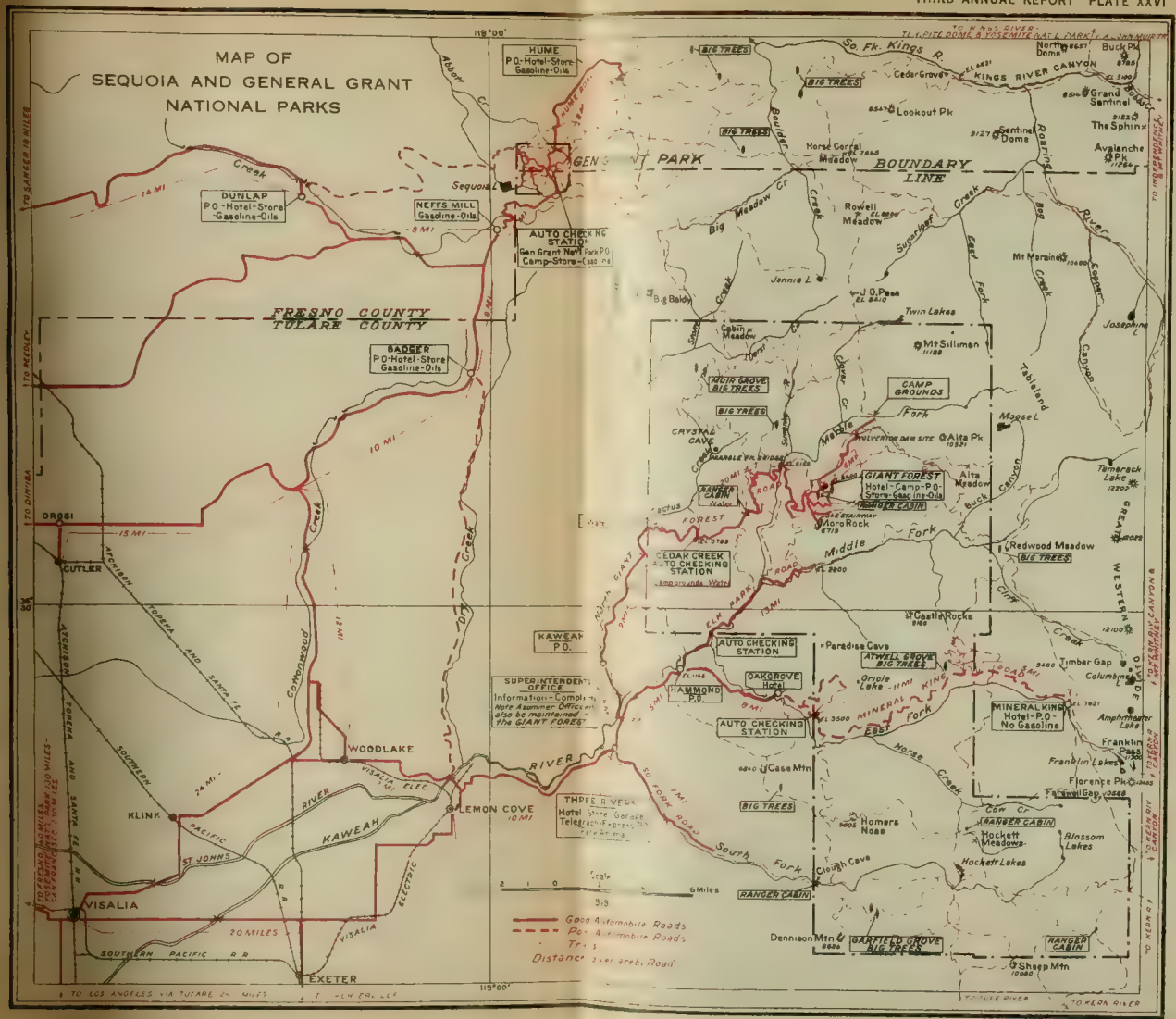
TRAILS.

There are 244 miles of trails in Sequoia Park, all of which are in good condition. There are, however, about 4 miles of the Little Kern River Trail that should be relocated and constructed on better grade.

There are 10 miles of trails within General Grant National Park, all of which are in fairly good condition.

TELEPHONE LINES.

There are 100 miles of telephone lines in the Sequoia National Park system, and 1½ miles in General Grant National Park system. Both systems were gone over early in the season and put in good working order, as result of which excellent service has been maintained thereover throughout the season.


MAP OF
SEQUOIA AND GENERAL GRANT
NATIONAL PARKS
HUME
PO-Hotel-Store
Gasoline-Oils
DUNLAP
PO-Hotel-Store
-Gasoline-Oils
NEFFS MILL
Gasoline-Oils
AUTO CHECKING STATION
Gen Grant Nat'l Park PO
Camp-Store-Gasoline
BADGER
PO-Hotel-Store
Gasoline-Oils
FRESNO COUNTY
TULARE COUNTY
BOUNDARY LINE
GIANT FOREST
Hotel-Camp-PO-
Store-Gasoline-Oils
RANGER CABIN
CAMP GROUNDS
CEDAR CREEK
AUTO CHECKING
STATION
KAWEAH
P.O.
SUPERINTENDENT'S
OFFICE
Information-Comp
Note Summer Office
also be maintained
the GIANT FOREST
AUTO CHECKING
STATION
HAMMOND
P.O.
OAK GROVE
Hotel
AUTO CHECKING
STATION
THREE RIVERS
Hotel Store Garage
Telegraph-Express
Cavern
MINERAL KING
Hotel-PO-
No Gasoline
ATWELL GROVE
BIG TREES
CRYSTAL
CAVE
Good Automobile Roads
Poor Automobile Roads
Trails
Distance
Scale
Miles
TO LOS ANGELES VIA TULARE 214 MILES
TO VISALIA 20 MILES
TO EXETER
TO LEMON COVE 10 MI
TO WOODLAKE
TO KLINK
TO OROSI
TO CUTLER
TO DINUBA
TO REEDLEY
TO SANGER 18 MILES
TO FRESNO 76 MILES
TO KINGS CANYON
TO KERN R.
TO TULE RIVER
ENGRAVED AND PRINTED BY THE GEOLOGICAL

SANITATION.

Frequent inspections of permanent camps were made throughout the tourist season. The grounds were policed, and privy buildings that contained earth pits were regularly looked after. Many additional garbage pits were provided at convenient places throughout the camps for use of campers in disposing of their kitchen garbage.

A very important condition regarding the sanitary situation has recently materialized in General Grant National Park, which I consider is deserving of attention by the Service, and is as follows:

Mr. A. D. Ferguson, of Fresno, Calif., recently purchased 160 acres of land immediately adjoining the headquarters and main tourist camp. This land has already been divided up into small lots, and I am informed that a large number of these lots have been disposed of to private individuals for summer homes and that other sales will soon follow. Since this is being organized as an independent camp, I am very solicitous as to the proper sanitary development of this particular locality. Unless a suitable safely piped water supply is secured for this camp and adequate sanitary means of excreta disposal provided for at the beginning, there is bound to be produced, in my opinion, insanitary conditions, which may become not only a serious menace to occupants of this camp but also to those living in adjoining camps on the Government land.

WATER SUPPLY.

The water supply for the Giant Forest tourist camp in Sequoia National Park is furnished by means of a piped system taken from two large springs and a small stream known as Sherman Creek. If conservatively used, the present system is capable of supplying about 1,000 people at one time. This season the supply was taxed to its utmost capacity during the months of July and August. As patronage to this camp is bound to increase from year to year, it is evident that the present water system will prove inadequate to meet future demands. This is a matter that should be given consideration in the very near future, looking to a more bountiful supply of water for the camp, which can best be accomplished by adding to the present system a pipe line intake at Wolverton Creek, in distance some 4 miles.

The water supply at the camp in General Grant National Park was lower than at any time recorded previously, but was sufficient to meet all demands.

IMPROVEMENTS.

Improvement work accomplished in the Sequoia and General Grant National Parks during the fiscal year 1919 was as follows:

Sequoia National Park.—A new rustic log bridge, 144 feet in length and 18 feet in width, supported on concrete piers and abutments, sightly in appearance and durable in character, has been constructed across the Marble Fork River on the Giant Forest Road crossing to take the place of the old wood truss, which has been in existence for 18 years, and which during the last year has been considered unsafe.

A new stone and concrete building, 19 by 22 feet, has been constructed at Rocky Gulch as a container for explosives.

A new trail, 6,600 feet in length, with minimum width of 3 feet and maximum width of 6 feet, has been constructed from the Black Oak Trail junction to Crystal Cave, as the means of making the cave accessible to the traveling public.

Mr. W. B. Rowland, who holds a lease from the department, erected a very neat three-room cottage in Giant Forest, to be used for dwelling purposes.

A traverse line survey 10 miles in length has been completed on the Middle Fork-Giant Forest Road, with a view of obtaining a more feasible route for location of the road and an estimate of the cost thereof.

Roads have been improved and repaired as follows:

Giant Forest Road from west boundary to Giant Forest, 20 miles, entire roadbed graded and eight passageways for vehicles constructed by blasting out mountain sides, thus widening the road from 10 to 20 feet, with approximte length of 900 feet.

Moro Rock Road from Giant Forest to Moro Rock, 2 miles, entire roadbed graded and fallen logs cleared from right of way.

Sequoia-General Grant Park Road from Giant Forest to Marble Fork River, 7 miles, entire roadbed graded, fallen logs and landslides cleared from right of way.

Camp Circuit Road around outer border Giant Forest Camp, 1 mile, graded and washouts filled in.

Trails have been improved and repaired as follows:

South Fork trail and intersecting trails, from west to east park boundary, 64 miles, washouts filled in, logs and landslides cleared from right of way.

Alta Trail, from Giant Forest to east park boundary, 8 miles, washouts filled in, widened, and logs cleared from right of way.

Halstead Trail, 12 miles, widened, rocks and logs cleared from right of way.

Colony Mill Trail, 8 miles, landslides removed and brush cut from right of way.

Hospital Trail, 6 miles, widened and brush cut from right of way.

Main River Trail, 9 miles, objectionable rocks blasted out and brush cut from right of way.

Seven-mile Hill Trail, 8 miles, graded, washouts filled in and brush cut from right of way.

Cold Spring Trail, 13 miles, brush, logs, and rocks cleared from right of way.

Tar Gap Trail, 4 miles, logs cleared from right of way.

Telephone lines have been repaired and improved as follows:

South Fork telephone line, from Three Rivers to Quinn, 32 miles, 22 additional poles manufactured and set, new brackets applied and broken wires spliced.

Atwell Mill telephone line, from Three Rivers to east park boundary, 28 miles, broken wires spliced and brush cleared from right of way.

Giant Forest telephone line, from Three Rivers to Giant Forest, 32 miles, repaired and cleared brush from right of way.

Buildings have been repaired and improved as follows:

Giant Forest post-office building, one additional room and new siding applied, roof painted.

Giant Forest ranger's cabin, one additional room and overhead ceiling applied.
Water system at Giant Forest tourist camp, 4,400 feet new pipe and 32 drinking hydrants applied.
Sanitation has been improved as follows:
Nine new privy buildings and 22 additional privy pits.
General Grant National Park.—A new administration building has been built at the headquarters camp. The building consists of a one-story, three-room frame structure 22 by 28 feet.
Road repairs and improvements were as follows:
Stephens Grade and Millwood road, from south to north and west park entrances, 10 miles, roadbed graded, washouts filled in, rocks and stumps blasted from right of way.
Water-system improvements were as follows:
Water system in main tourist camp, 2,426 feet additional new pipe, 22 drinking hydrants, and one concrete reservoir applied.
Sanitation improvements were as follows:
The main camp grounds were provided with new privy and garbage pits.

CAMPING AND CAMP SITES.

Camping out beneath the shades of the forests, where the weather even at midday in summer is balmy and cool in the areas set aside for their use and pleasure, seems the principal desire of most persons visiting the Sequoia and General Grant National Parks, and for this reason many beautiful and commodious camp sites were prepared in advance of the date set for the official opening of the parks this season.
In Sequoia Park seven camps were established, in locations as follows: Giant Forest, Marble Fork River, Wolverton, Twin Lakes, Hospital Rock, Hockett Meadow, and Quinn. One camp sufficiently large to accommodate all of the park visitors was maintained in General Grant National Park. In all instances camp grounds, wood, and water were furnished free of cost.

CONCESSIONS.

Sequoia National Park.—The Sequoia National Park Stage Co. operated through the season on a regular daily schedule standard seven-passenger automobile touring cars between Lemon Cove and Giant Forest in the park.
Mrs. Walter E. Kenney operated a hotel with tent sleeping accommodations in Giant Forest during the season.
Mr. Chester Wright was granted the store privilege in Giant Forest. Mr. Wright also conducted the pack and saddle transportation service in the park.
Messrs. George F. Belden and Lindley Eddy were granted concessions in Giant Forest for conducting photograph galleries and the sale of photographic supplies.
General Grant National Park.—The General Grant National Park Hotel Co. was granted permission to conduct a tent camp with hotel accommodations and store in the park.
The Kings River Stage and Transportation Co. operated through the season on a regular daily schedule standard Packard auto stages between Sanger and the park.
Mr. H. E. Roberts was granted concession for conducting a photograph gallery and the sale of photographic supplies in the park.
All concessioners operating in the parks showed their usual fine spirit of cooperation, and complaints from the public were but few.

INSECT CONTROL.

During the season of 1918 the western pine beetle and mountain pine beetle killed approximately 600,000 feet of merchantable yellow-pine and sugar-pine timber within the Marble Fork and Cactus Creek Basins in Sequoia National Park, according to records from 183 trees marked and studied by the United States Bureau of Entomology. A fund of $603.48 left over from the project in the Middle Fork of the Kaweah River (unit No. 10, which had been completed) was expended in the treatment of this infestation during the spring of 1918, but was insufficient to cover the entire area involved.
During the fiscal year 1919 the Bureau of Entomology carried on some work with its own resources in order to protect the area treated in 1918 and also to demonstrate and test a new method of applying the percentage of control. This bureau expended $136 for labor besides providing the salary and expense of Entomological Ranger Albert Wagner, who conducted the work under directions of Mr. John M. Miller, assistant forest entomologist. This project was limited entirely to the Marble Fork Basin. The following shows the amount of timber treated under this method:

	Number of trees.	Board feet.
Standing infested trees treated	18	50,040
Suppressed and injured trees felled and utilized for trap trees	29	80,800
Windfalls and trees felled in construction work and utilized for trap trees	6	15,580
Total	53	146,420

The advantages to be gained from this system of applying the regular methods of control are already evident. It is believed that by continuing this system through the season of 1920, so as to cover the Marble Fork and Cactus Creek Basins, that very little additional work will be necessary and funds have been provided by the National Park Service as a cooperative measure with the Bureau of Entomology to provide for the completion of the projects which have been started and to meet any new attacks that may develop.
The cooperation which has been afforded by the Bureau of Entomology to the field investigation by the National Park Service has made possible the advance of this work under the most favorable conditions. A method of destroying the broods of the western

pine beetle without resorting to the use of fire is being developed, which it is believed will make possible the continuance of control work throughout the summer. In order to follow up these investigations, which will include a study of the seasonal history and biology of the insect enemies of the forest of this region, a temporary field laboratory is being considered to be located at some convenient point near Giant Forest.

FORESTS.

The forests of the parks are in normal condition and are well protected. In general, reproduction in the main timber belt is prolific. One of the largest seed crops ever observed is developing on the pines and will mature in the autumn of 1920.

It is estimated that 80 per cent of the area of Sequoia National Park and 95 per cent of General Grant National Park are forested. In the Sequoia Park the elevation varies from 1,100 feet at the western park boundary to 11,900 feet at the crest of the Great Western Divide on the east. In the ascent, which can be made in one day, one passes through all of the life zones of habitation that would be encountered in traveling from Mexico to the Arctic Circle.

Foothill forests.—The lack of moisture and the long period of annual drought at the lower elevations make a growing condition which but few trees can survive. We therefore find the hillsides up to 4,500 feet elevation clothed with chaparral (brush) interspersed with scattered oaks and buckeye. Along the streams is a fringe forest of moisture-loving species, such as willows, sycamore, alder, and cottonwood.

The timber belt.—The largest stands of timber and the more dense forests lie between 4,500 feet and 7,500 feet elevation. All of the most valuable species occur in this belt. Between 4,500 feet and 5,500 feet one finds almost pure stands of western yellow pine, with here and there an incense cedar. Above this elevation the white fir and sugar pine enter the mixture, making a very typical forest which extends to about 7,500 feet. Toward the upper edge of this belt the pines are gradually replaced by the firs. The place of the western yellow pine is taken by its close relative, the Jeffery pine, and red fir enters the mixture. The sequoia groves occur in the upper half of the timber belt, almost always with an understory of firs, sugar pine, and cedar.

High mountain forests.—At about 7,500 feet elevation the mixed forest merges into pure stands of fir. These are dense, but the trees are neither large nor commercially valuable. At about 8,000 feet lodgepole pine enters the stand and on flat and moist sites crowds out all other species. Above 8,500 feet the forests become open and parklike and western white pine and juniper enter into the forest composition. At timberline all species disappear except the foxtail pine, gnarled specimens of which reach an elevation of 10,500 to 11,000 feet.

From a commercial standpoint the middle timber belt is by far the most important. Considered from the protection standpoint, however, each belt has its own important function. The brush on the lower hillsides holds the soil in place and thus prevents erosion during the heavy winter rains. The timber belt, with its deep-leaf mulch on the forest floor, protects the ground surface and, spongelike in its action, retains and gives up gradually a large proportion of the precipitation, thus maintaining an even stream flow. In the higher elevations the forests, besides preventing surface erosion, protect the accumulated winter snows and retard their melting, thus equalizing stream flow, preventing spring floods, and conserving the water supply for the summer months.

FOREST FIRES.

The season just passed was a remarkably lucky one with respect to forest fires. Notwithstanding the fact that practically four months passed without rainfall, but one fire occurred in either the Sequoia or General Grant National Parks during the 1919 season.

The fire above referred to occurred on August 18 along the southern border of Giant Forest in Sequoia Park and about 1½ miles distant from the Giant Forest tourist camp, where approximately 1,000 people were camped. Never before within the memory of man has the wonderful Giant Forest been so seriously threatened with partial if not complete destruction as by this fire.

The fire was discovered about 11 o'clock a. m., and within less than 30 minutes after the alarm was given all available men of the camp were rushed to the scene of the fire, and by heroic efforts the fire was quickly surrounded and later extinguished, after having burned over an area of approximately 10 acres.

The fire did but little damage other than to what is known as the "Chimney Tree," which is practically destroyed. This tree was a living sequoia 24 feet in diameter, with top broken off 170 feet above ground, and in some past time has been hollowed out by fire, so that a person might crawl through an aperture and look out through the top, which was fringed by green branches. But this fire entered in the immense hollow of the tree, and, drawn up through the chimney, it burned away the sides, leaving two charred halves as the remains of what has been for several years past one of the subjects of special interest to park visitors in Giant Forest.

The origin of the fire is unknown.

WILD FLOWERS.

The Sequoia and Geneal Grant National Parks are especially noted for the wild flowers they contain. I venture the assertion that there is no other equal given area within the United States that contain so many different varieties of floral growths as that of Sequoia Park. This is accounted for by reason that this park is so located geographically and the topography is so irregular as to yield four different zones of plant habitation.

The wide variety of conditions here found, ranging all the way from the hot semitropic Sonora zone on the west at the 1,100-foot level to the arctic zone on the east at the 11,900-foot level, gives to the flora an exceeding diverse and interesting character; in fact, so much so as to attract the attention of botanists from all parts of the world.

There are over 500 different species of wild flowers in the park aside from many other beautiful floral growths, all of which help to make up the landscape beauty of the park.

It has recently been observed that not a month in the year passes by without the blooming of new flowering specimens of some certain variety in the park, and since this fact has been ascertained botanists visit the park at various months in the year for the study of plant life, whereas a short time since they only came for their studies during summer.

WILD ANIMALS.

Deer and bear are numerous in the Sequoia and General Grant National Parks, and elk, mountain sheep, wolverine, mountain lion, wolves, foxes, and many smaller fur-bearing animals are found.

Bear and deer are seen daily by park visitors in the vicinity of the tourist camps and quite often elsewhere. Many scientists visited the parks this year for the sole purpose of studying the life habits of certain species of animals at close range.

Altogether 56 kinds of mammals are native to the parks, made up of the following species: Elk, deer, mountain sheep, squirrels, beaver, flying squirrels, rats, mice, pocket gophers, pocket rats, pocket mice, jumping mice, porcupine, badger, pica, hares, rabbits, bear, wolves, foxes, mountain lion, lynx, ring-tailed cat, raccoon, wolverine, skunks, martin, fisher, weasels, moles, shrews, and bats.

No material changes are noted this year from that expressed in my report for last year in the condition of the game, other than that of the deer and bear, which are more plentiful.

BIRDS.

The Sequoia and General Grant National Parks are the home of both migratory and breeding birds. Millions of these creatures either make their nests or spend a portion of each year within them. They are always more varied and abundant during the height of the tourist season, thus affording splendid opportunity to be studied at close range by scientists and park visitors.

Owing to the irregular topography of the parks, which grade all the way from the warm San Joaquin Valley to the arctic climate of perpetual snow on the summits of the Great Western Divide, birds of both the torrid and frigid zones come to them. There is a constant movement of the birds from the high mountains to the lower and from the lowlands to the higher elevations. Their movements in this respect become more active during the spring and autumn months, when food is scarce in the higher elevations; but within the course of one hour flight can be made from the highest mountain top to the warm valley below, where there is always food in abundance.

There are 162 species of bird life known to inhabit the parks, made up of the following: Loons, cormorant, ducks, geese, swan, herons, bitterns, coot, stilt, snipe, sandpiper, killdeer, plover, patridges, grouse, wild pigeon, dove, condor, vulture, hawks, eagles, owls, cuckoos, kingfisher, woodpeckers, goatsuckers, swifts, humming birds, flycatcher, lark, crow, raven, jays, magpie, blackbirds, oriole, finches, sparrows, grosbecks, siskin, juncoes, towhees, buntings, tanager, swallows, waxwing, phainopepla, shrike, vireos, warblers, wagtail, dipper, mocking bird, thrashers, wrens, creepers, nuthatches, titmice, kinglets, gnat catchers, thrushes, solitaire, robin, and bluebirds.

FISH.

Fishing was excellent in all the park waters the season throughout, and many people enjoyed catching the full limit.

Propagation and increase of fish in the mountain and park streams was made possible this year by the establishment May 3, 1919, on the Middle Fork Kaweah River at Hammond, Calif., 5 miles east of Three Rivers, and 2 miles outside the Sequoia Park boundary, of a temporary State fish hatchery, which hatched 400,000 mountain trout.

After much effort on the part of Tulare, Fresno, Kings, and Kern Counties to secure a State hatchery for the purpose of populating the mountain streams and lakes with fish, the California State Fish and Game Commission established the temporary hatchery at the place above mentioned as an experimental test, and since having found that the experiment was a success the construction of a large and permanent hatchery is contemplated in the very near future.

The State fish and game commission donated to the National Park Service a consignment of 233,000 trout fry, the output of this new hatchery, which were distributed and liberated in the waters of the Sequoia National Park, as follows:

June 24, Middle Fork Kaweah River, 50,000 black spotted; June 27, Wolverton Creek, 12,000 rainbow; June 27, Sherman Creek, 5,000 rainbow; June 28, Upper Marble Fork River, 20,000 rainbow; June 29, East Fork Kaweah River, 30,000 steelhead; June 30, Sequoia Creek, 10,000 rainbow; June 30, Deer Creek, 5,000 rainbow; July 8, East Fork Kaweah River, 50,000 rainbow; July 12, Horse Creek, 13,000 steelhead; August 28, Middle Fork Kaweah River, 15,000 steelhead; August 29, Lower Marble Fork River, 8,000 black spotted; August 30, Lower Marble Fork River, 10,000 black spotted; August 30, Upper Marble Fork River, 5,000 steelhead.

The waters of the Sequoia and General Grant National Parks are the natural home and breeding territory for mountain trout. The entire area of the parks being mountainous in character, they afford many streams and lakes that are continuously kept up with ever-melting snow and cold spring water, where food for fish is always abundant and all species of mountain trout thrive and do well.

The trout that inhabit the waters of the parks are of numerous species, natural and imported, and are noted for their brilliancy and richness of coloration and as a game and food fish. There are nine different species of trout that inhabit the park waters, as follows:

Kern River trout (*Salmo gilberti*), golden trout of Volcano Creek (*Salmo rooseveltl*), golden trout of Soda Creek (*Salmo whitei*), rainbow trout (*Salmo shasta*), steelhead trout (*Salmo rivularis*), cutthroat trout (*Salmo clarkii*), black-spotted trout (*Salmo henshawi*), Loch Leven trout (*Salmo levenensis*), eastern brook trout (*Salvelinus fontinalis*).

GRAZING.

Owing to the abundance of forage for stock in California there was not heavy demand for grazing privileges in Sequoia National Park this season, as was the case last year; consequently a reduction of 807 head was made in the number of stock admitted this year from that of last year, which brought the total number admitted this year to 1,325 head, all of which were cattle.

The past season was a profitable one for those persons holding grazing permits in the park, as the ranges were not overstocked and feed was excellent, and stock in general came out of the park in fine condition during the month of October.

No difficulty was encountered with any of the permittees, as parties concerned observed all park regulations and kept their stock well within the confines of the areas assigned to them.

No permits were issued for grazing in General Grant National Park.

RODENTS.

In order to comply with provisions of the California legislative act of March 13, 1909, having for its main purpose ground-squirrel eradication, a small quantity of poisoned grain was purchased and put out in those infested areas along the Middle Fork of the Kaweah River in Sequoia Park.

The work of destroying these rodents was pressed forward with much vigor last year, and as the result but few of the pests were found in the parks this year, and in fact the above-mentioned territory is about the only place of their occurrence in the parks.

DEATHS.

On July 5, 1919, Miss Dorthy Noyes, a lady 16 years of age, from Riverside (a suburb of Chicago), Ill., who was touring the Sequoia National Park with companions, died from heart disease in Giant Forest Camp. Her body was embalmed by an undertaker from Lindsay, Calif., and shipped to her home.

On July 27, 1919, Mr. H. Robbins, a middle-aged man and a wanderer, was picked up in a semiconscious condition a short distance north of General Grant National Park by Ranger Robert N. Roberts. The man was brought to the park headquarters, where medical aid and attendance were given him, but he died on July 30. A coroner's inquest was held over the remains on July 31, with the verdict that the deceased came to his death by reason of alcoholism and exposure. The body was taken to Fresno, Calif., for interment.

RECOMMENDATIONS.

That pending legislation providing for the extension of the boundaries of Sequoia National Park, to include the Kings and Kern River Canyons and the crest of the Sierra Nevada Range, receive the early consideration of Congress.

That Congress be requested to provide measures whereby title to the patented lands within the Sequoia and General Grant National Parks may be acquired by the United States Government for park purposes.

MOUNT RAINIER NATIONAL PARK.

ROGER W. TOLL, Superintendent, Ashford, Wash.

GENERAL STATEMENT.

Mount Rainier National Park was created by act of Congress approved March 2, 1899, and exclusive jurisdiction of the territory so set aside was ceded to the United States by act of Legislature of the State of Washington approved March 16, 1901. Exclusive jurisdiction of the reservation was accepted by act of Congress approved June 30, 1916.

The park is located in the western part of the State of Washington, immediately west of the summit of the Cascade Mountains and about 40 miles southeasterly from the southern end of Puget Sound. It is situated largely in Pierce County, but a portion lies in Lewis County. The main entrance to the park is located near the southwest corner, distant by automobile road 96 miles from Seattle, 56 miles from Tacoma, and 6½ miles from Ashford, on the Tacoma & Eastern Railroad, a branch of the Chicago, Milwaukee & St. Paul Railroad.

Longmire Springs, distant 6½ miles by automobile road from the main entrance, is the headquarters within the park of the park superintendent and the Rainier National Park Co. Longmire Springs is connected by telephone to Seattle, Tacoma, and the principal camps and ranger stations within the park.

Mount Rainier National Park is in charge of a superintendent, who is assisted throughout the year by a clerk-stenographer and four permanent park rangers. During the summer season of this year the local force was increased by eight temporary park rangers and a small construction and repair force.

TOPOGRAPHY.

The northwest corner of the park by road and trail travel is about 45 miles southeast from the tidewaters of Puget Sound, an arm of the Pacific Ocean, from which region Mount Rainier appears as a most imposing spectacle—an ice and snow clad dome 14,408 feet high.

The park reserve is nearly a perfect square, the sides of which are 18 miles in length, and contains 640 sections, or approximately 207,360 acres. The area is completely surrounded by the lands embraced within the Rainier National Forest.

Near the center of the park is the summit of Mount Rainier, from which radiates a system of glaciers ranking in importance with any similar system or group of glaciers in the world. There are more than a score of these glaciers, from which originate four important rivers, the Nisqually, the Puyallup, the White, and the Cowlitz, the three first named having large electric power generating plants located on them at points outside the park, but all dependent upon this glacial system and the waters originating therein. The Cowlitz is as important as the others in this respect, but as yet complete development of power-generating plants has not been accomplished.

The general elevation of the river valleys at the boundary line of the park is 2,000 feet above sea level. From the boundary lines these valleys afford a comparatively easy grade to the terminals or lower ends of the most important glaciers, which come down the mountain sides to an elevation of four or five thousand feet. The Carbon Glacier reaches the lowest elevation and terminates at a point about 3,500 feet above sea level. These glaciers impress upon the traveler the real Alpine nature of the Mount Rainier National Park.

FORESTS.

More than 100 square miles of the park lands are densely timbered. Douglas fir, white cedar, Alaska cedar, and hemlock are the predominating varieties. In addition to those named, the following varieties are found at various points within the park: Lovely fir, Noble fir, Alpine fir, silver fir, Alpine hemlock, spruce, white pine, black (or lodgepole) pine, alder, cottonwood, quaking aspen, broad-leaf maple, vine maple, and smooth-leaf maple.

At the approximate general elevation of 4,500 feet the density of timber growth gradually diminishes until the extreme timber line is reached. The intervening areas, which are usually benches or plateaus on the long sloping ridges, dividing the various glacial basins, form beautiful natural parks, to which tourists resort in large numbers for rest and recreation. These natural parks are excellent camp sites and serve as bases for the arduous task of ascending to the summit of Mount Rainier and for exploring the lesser mountain peaks, the glaciers, snow fields, and canyons so numerous within the national-park area.

These upland meadows, benches, plateaus, or natural parks are beautifully adorned by nature with flowers and shrubs of infinite variety and color, and furnish to the botanist, as well as to the lover of the beautiful, endless occupation in nature study. Nearly 400 varieties of plant life are known to grow within the park.

FLOWERS.

For each State of the Union there is a "State flower." If the national parks were each to adopt a "park flower," that of Mount Rainier National Park would certainly be the avalanche lily (known also as the deer tongue, dog's-tooth violet, and other popular names). As soon as the snow drifts begin to disappear from the hillsides the white lilies spring up in great abundance, forming waving fields of delicate white blossoms that follow closely on the retreating lines of the snow. Some of them, with a remarkable prophetic instinct, send up their tender shoots through the edges of the snow banks and are in bud before the sun has even had a chance to warm the ground. Their season of growth on the higher slopes is short and they make the most of it.

Most of the varieties of flowers bloomed in abundance this summer. The red heather was unusually brilliant, with its blossoms in thick clumps, as though each plant was competing with its neighbor for the most brilliant display. Visitors also carry away with them vivid impressions of waves of lupin forming lakes of brilliant blue.

The flowers start to appear on the lower elevations with the early spring, and as the snow line climbs up the mountain slopes the flower line follows rapidly behind it, so that in going from high elevations to lower valleys one finds the flowers in all stages of development from buds to the developed seed pods that are ready to renew the cycle during the coming year.

Visitors are urged to enjoy the beauty of the flowers without destroying them, so that the wealth of blossoms will remain to greet future visitors.

ROADS.

Nisqually Road.—This road is the main thoroughfare into the park. It leads from the southwest, or Nisqually, entrance to Paradise Valley, a distance of 20.4 miles. It was originally constructed by the War Department under an appropriation of $240,000 and was opened for travel in 1910.

Horse stages were operated over the 8-mile section above the Nisqually Glacier until the close of the 1914 season. This section was opened to automobiles on June 20, 1915, and has since been operated on a one-way schedule, by which cars leave Nisqually Glacier and Paradise Valley on each hour from 8 a. m. to 7 p. m., passing at Narada Falls on the half hour. During the tourist season the traffic is controlled by three park rangers stationed at Nisqually Glacier, Narada Falls, and Paradise Valley. The system, which has proven very satisfactory during the past four seasons, is operated in the following manner:

As soon as the road is clear—which under normal conditions occurs 5 or 10 minutes before the hour—the rangers at Nisqually Glacier and Paradise Valley pass the waiting automobiles through the gate, which is held open until about five minutes after the hour; then they close the gate and report by telephone to the ranger at Narada Falls, giving the number of cars in the train and the license number and make of the last car. As the cars arrive at Narada Falls from each direction they are held in the passing space by the ranger until the last cars have arrived, and then allowed to pass.

The ranger then reports by telephone to the other rangers and gives the number of the last car in each train.

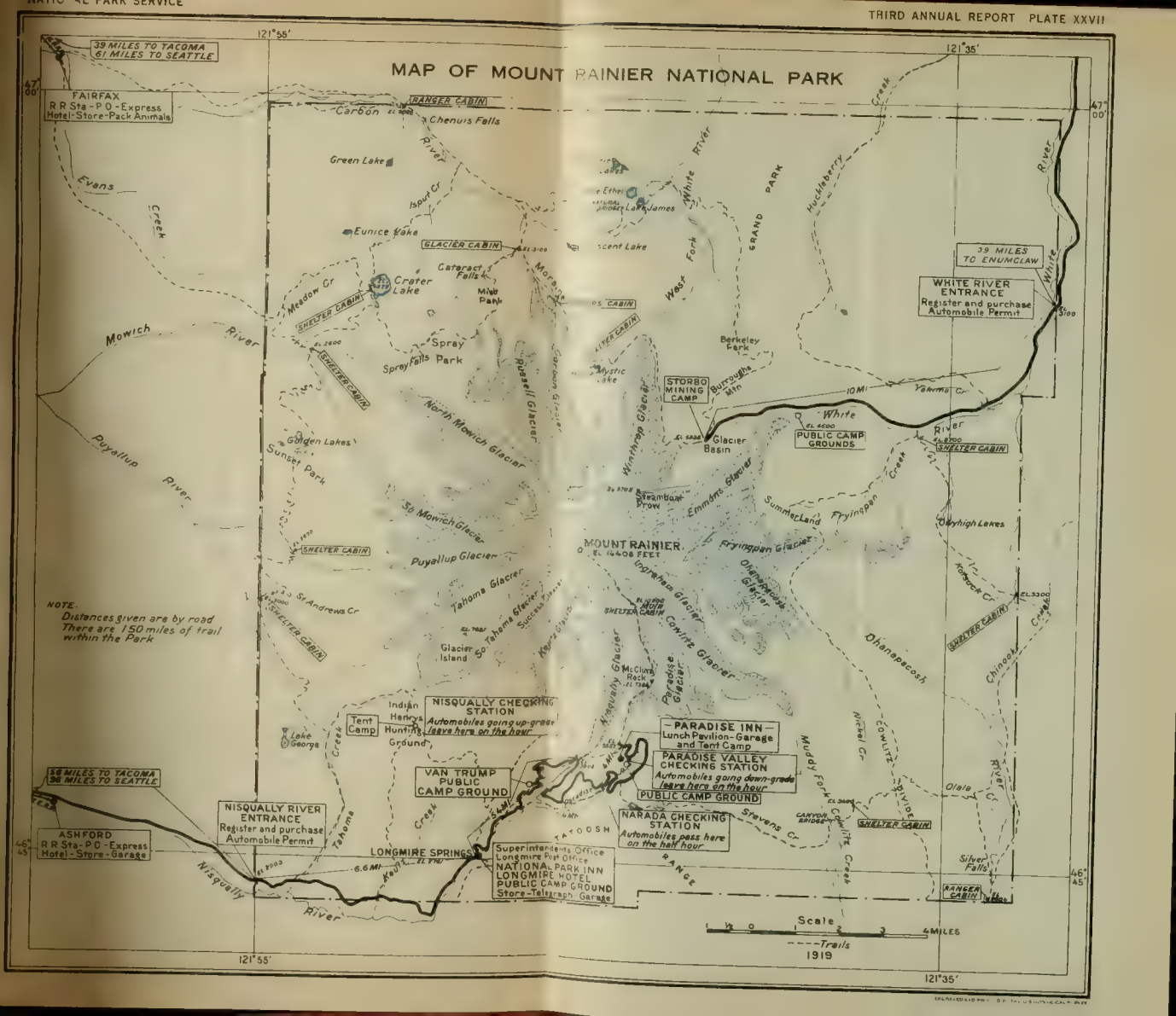
When weather and road conditions are favorable, trains of 100 to 125 cars can be handled on the hourly schedule. In one instance during the past season as many as 288 cars have been passed through in a train, requiring considerably more than one hour's time to clear the road.

During the past five years about 35,000 cars and 175,000 people have passed over this section of the road without any serious accidents.

White River Road.—This road was not in operation this year, as it was closed by washouts and slides. Lack of funds prevented the expenditure of the sum required to put this road in satisfactory condition for public use.

The McClellan Pass Highway leading out from Enumclaw is now completed and surfaced to The Dalles, 29 miles. Money has been appropriated by the State legislature and by the Department of Agriculture for improving the 10-mile section between The Dalles and the ranger station at the White River entrance of the park. A contract has now been let and the contractor is at work on the road. It is expected that this work will be completed as far as the park entrance in 1920.

When this road is completed to the ranger station, large numbers of people will visit this section of the park, and further improvement of the road within the park will be desirable.


MAP OF MOUNT RAINIER NATIONAL PARK
121°55'
121°35'
47°00'
46°45'
39 MILES TO TACOMA
61 MILES TO SEATTLE
FAIRFAX
R R Sta - P O - Express
Hotel - Store - Pack Animals
RANGER CABIN
Carbon
Chenuis Falls
Green Lake
Evans Creek
Mowich River
Puyallup River
Eunice Lake
GLACIER CABIN
Cataract Falls
Crater Lake
Meadow Cr
SHELTER CABIN
Spray
Spray Falls Park
Golden Lakes
Sunset Park
North Mowich Glacier
Russell Glacier
Carbon Glacier
St Mowich Glacier
Puyallup Glacier
St Andrews Cr
Tahoma Glacier
Success Glacier
Kautz Glacier
Glacier Island
Lake George
Tent Camp
Indian Henry's Hunting Ground
NISQUALLY CHECKING STATION
Automobiles going up-grade leave here on the hour
VAN TRUMP PUBLIC CAMP GROUND
56 MILES TO TACOMA
36 MILES TO SEATTLE
NISQUALLY RIVER ENTRANCE
Register and purchase Automobile Permit
ASHFORD
R R Sta - P O - Express
Hotel - Store - Garage
LONGMIRE SPRINGS
6.6 Mi
Kautz
Nisqually River
Tahoma Creek
Superintendent's Office
Longmire Post Office
NATIONAL PARK INN
LONGMIRE HOTEL
PUBLIC CAMP GROUND
Store - Telegraph Office
TATOOSH RANGE
NOTE:
Distances given are by road
There are 150 miles of trail within the Park
White River
Mystic Lake
Berkeley Park
Burroughs Mtn
STORBO MINING CAMP
Glacier Basin
PUBLIC CAMP GROUNDS
Winthrop Glacier
Steamboat Prow
Emmons Glacier
Fryingpan Creek
Summerland
Fryingpan Glacier
MOUNT RAINIER
EL 14408 FEET
Ingraham Glacier
Cowlitz Glacier
Paradise Glacier
McClure Rock
Nisqually Glacier
PARADISE INN
Lunch Pavilion - Garage and Tent Camp
PARADISE VALLEY CHECKING STATION
Automobiles going down-grade leave here on the hour
PUBLIC CAMP GROUND
NARADA CHECKING STATION
Automobiles pass here on the half hour
Paradise River
Stevens Cr
Muddy Fork Cowlitz River
Nickel Cr
Ohanapecosh Glacier
Ohanapecosh
Olallie
Silver Falls
Chinook Creek
Kotsuck Cr
Owyhigh Lakes
39 MILES TO ENUMCLAW
WHITE RIVER ENTRANCE
Register and purchase Automobile Permit
Yakima Cr
Scale
0 1 2 3 4 MILES
Trails
1919

TRAILS.

The mountain is entirely encircled by the trails within the park. With the exception of the 12-mile section between Carbon Glacier and Glacier Basin, these trails have been improved and are in first-class condition. During the year 1919 several parties made the complete circuit of the mountains, some on horseback and some on foot.

The work done on trails during 1919 consisted principally in the opening, maintenance, and improvement of the various trails. At the beginning of summer each year the trails are impassable to horse travel because of trees that have fallen across them during the winter and also because of slides and washouts. It is necessary to go over all of the principal trails each year and first get them passable, and later in the season, as opportunity offers, the work of improvement can be carried on.

A new trail 2 miles in length was opened up during 1919, so as to give access to the beautiful upland park at the head of Klapatche Ridge. This trail starts from the West Side Trail, north of St. Andrews Creek, and after gaining the crest of Klapatche Ridge follows this ridge until the park and lake are reached at an elevation of about 5,500 feet. This park is among the most attractive of the many parks on the slopes of Mount Rainier and makes a favorite camping site for parties taking the trip around the mountain.

There are 150 miles of trails in the Mount Rainier National Park, some of which are for pedestrians only, but the greater part are equally suitable for foot or horseback travel.

ROAD MAINTENANCE AND IMPROVEMENT.

The following amounts have been expended on maintenance and improvement of the Nisqually Road from the southwest entrance to Paradise Valley, 20 miles:

July 1, 1914, to June 30, 1915	$32,364.19
July 1, 1915, to June 30, 1916	17,865.94
July 1, 1916, to June 30, 1917	25,560.58
July 1, 1917, to June 30, 1918	32,421.05
July 1, 1918, to June 30, 1919	6,738.76
July 1, 1919, to date (approximate)	7,000.00
Total	$112,990.52

This work has included general repair and improvement, consisting of widening from 12 to 16 and 18 feet. Construction of new culverts and bridges, rock and timber crib retaining walls, timber guard rails, rock guard walls, and surfacing with 6 inches of cement gravel.

The following amounts have been expended on the construction and improvement of the White River Road:

By Mount Rainier Mining Co	$38,500.00
By National Park Service, since July 1, 1917	12,990.76
Total	$52,490.76

BUILDING CONSTRUCTION.

A powder house, 14 by 18 feet, was constructed in 1919. The location is on the Tahoma Creek Trail, at a safe distance from the automobile road. The cost of the building was $500. The magazine is used for the storage of the 30 tons of T. N. T. received from the War Department.

SANITATION.

During 1919 a 6-inch sewer line 1,100 feet long was installed to take the sewage of Paradise Inn to the Paradise River.

TELEPHONES.

The park system consists of the following lines:

Commercial line.—The Government double-wire metallic line formerly operated by the Tacoma & Eastern Railroad Co. From Ashford to Longmire Springs, 13 miles.

Government single-wire line.—From Nisqually Entrance to Paradise Valley via Longmire Springs, Glacier Checking Station, and Narada Falls, 13 miles.

From Nisqually entrance to Carbon River ranger station via West Side Trail, 40 miles.

From Narada Falls to Ohanapecosh ranger station via Ohanapecosh Trail, 15 miles.

From Ohanapecosh ranger station to White River Road via East Side Trail, 17 miles.

From Longmire Springs to Paradise Inn, 6 miles.

Total mileage of telephone wires, 104 miles.

The park telephone system connects at Longmire Springs and Ohanapecosh ranger station with the Forestry Service lines in the territory south of the park.

A telephone line has been constructed along the McClellan Pass Highway from Enumclaw to a point above Greenwater River, 23 miles. The Mount Rainier Mining Co. has constructed a line from the White River ranger station down to Silver Creek. This leaves about 11½ miles of line yet to be built between Enumclaw and the White River ranger station.

During 1919 a telephone switchboard was installed at Longmire Springs and operated for a period of 16 hours per day during the tourist season.

MEDICAL SERVICE.

During the 1919 season medical and hospital service to park employees was rendered by Drs. Long and Bridge, of Ashford, Wash., and Eatonville, Wash., on the basis of a pay-roll deduction of $1 per month from the men's salaries.

ACCIDENTS AND DEATHS.

Two minor accidents occurred to men employed on the park work. These were reported to the United States Employees' Compensation Commission, and injury claims were paid by the commission.

One man, camping at Longmire Springs, died of tuberculosis.

John D. Meredith, of Portland, Oreg., lost his life by falling while climbing on Little Tahoma Peak. This peak had been ascended by but two men prior to this year and is considered a difficult and dangerous ascent. Its elevation is 11,117 feet above sea level. On August 6 a party of three men from the camp of the Mazamas made a successful ascent. On August 14 Meredith and Lee Benedict, both of the Mazama party, left camp in the morning and climbed to the top of the peak, reaching the summit about 5.30 p. m. The descent proved to be slow and difficult. At 9.15 p. m., when they had made only the first part of the descent, on the east side of the peak, Meredith called to his companion that he was losing his nerve and a moment later fell some 40 or 50 feet, and then rolled several hundred feet. It is probable that he fainted before falling. His skull was fractured, right arm broken, and internal injuries were received. Death must have been instantaneous. Benedict returned to the Mazama camp for help, reaching there about 1 o'clock the following morning, and soon afterwards a party started back to Little Tahoma Peak. The body was brought down, part of the way on a toboggan, and sent to Portland for burial. Meredith was an overseas soldier, aged 24 years, and unmarried. One member of the party that recovered the body fell into a crevasse on the return trip, but fortunately no injuries resulted.

VIOLATIONS OF LAW.

As a rule park visitors have shown a disposition to comply with the park regulations and have made frequent inquiries of park officers regarding the regulations.

Minor violations have been reprimanded, and a few cases have been referred to the park commissioner. Three fines were imposed for cutting green timber near camp sites.

FOREST FIRES.

No serious forest fires have occurred in the park during the year. A number of fires have been started, one by lightning, one by blasting, one by firecrackers, several by unextinguished camp fires, and several by undetermined causes. In each case prompt action by rangers and other park employees has prevented the spread of the fire.

There were numerous forest fires in the areas lying outside of the park, a number of which were located and reported by the forest service from the Anvil Rock fire lookout station on Mount Rainier.

RANGER SERVICE.

The ranger force during the winter months consisted of 4 men. This was increased to 12 men during the tourist season. The collection of automobile revenues and the issuance of permits were handled by two rangers at the park entrance. The control of traffic on the one-way road was handled by one ranger at Glacier Station, one at Narada Falls, and two at Paradise Valley. One ranger was stationed at Longmire Springs. One ranger was in charge of the trail work in the southwestern portion of the park. One ranger was stationed at each of the following points: Ohanapecosh Station, White River Station, and Carbon River Station. These rangers maintained and improved the trails in their respective territories in addition to their patrol duty. One ranger was detailed to the United States Biological Survey party that spent the season in the park on field work for the preparation of a pamphlet on the birds and mammals of the Mount Rainier National Park.

FISH AND WILD ANIMALS.

The streams and lakes that were stocked in July, 1917, are closed to fishing until April 1, 1921. A few large trout have been caught in Mowich Lake and some small fish in other lakes and streams. With the exception of parties visiting remote portions of the park, practically no fishing has been done by park visitors.

A party from the United States Biological Survey has spent the summer in the park collecting data for the publication of a pamphlet on the birds and mammals of the Mount Rainier National Park. This pamphlet will be of much interest to visitors.

None of the wild animals of the park are very abundant. Deer in considerable number live in the park, but few of them are tame enough to visit localities frequented by visitors. The cougar is perhaps the most destructive animal in the park, though there was little evidence of his presence during the past year. Timber wolves were also quite destructive. Both feed largely upon deer. Coyotes visit Paradise Valley and the alpine meadows all around the mountain during the winter season. They are more abundant on the south and east sides of the mountain, where they come in bands; but they are often found in the heavily timbered areas of the park, though never in great numbers. In the upper region they seem to search for the ptarmigan and grouse. In the lower or wooded area the snowshoe rabbit is their principal victim.

The wildcat is more abundant than the cougar. Snowshoe rabbits and other small animals fall an easy prey to his ferocity. The Canada lynx is very similar to the wildcat. This animal is quite rare in the park.

The otter was found formerly in the park, but has not been seen for a long time. Minks, weasels, ermines, fisher, and marten are often seen. These, though chiefly small, are valuable fur-bearing animals.

The black bear is one of the common wild animals of the park. He hibernates in the upper regions of the park in ravines which have become filled with snow. In the forest he selects a large hollow cedar for his winter quarters. This species has been seen many times in the vicinity of Reflection Lake.

The raccoon is a common prowler around Longmire Springs in the winter nights.

The Douglas squirrels and chipmunks furnish much amusement for park visitors.

The whistling marmots always attract attention by their piercing shrill whistles. The nicely arranged bundles of leaves, grass, etc., near their burrows are always characteristic signs of these hibernating animals.

The beavers are interesting animals, and their houses and dams are visited by many tourists. On the Tahoma Creek trail, about 2 miles up from the automobile road, the beaver built a dam which formed a reservoir and flooded a bridge on the trail. The trail has been relocated this year in order not to interfere with the beaver dam.

The mountain beaver is not at all rare. The work of this nocturnal animal is common along the trails, roads, and forest.

The rock rabbit, cony, or pica lives in piles of rock and talus slopes. He puts up dried vegetation for winter use. He often utters a shrill note to attract attention.

The mountain goat is found in the higher altitudes nearly all around the mountain. They are more abundant on the east side than anywhere else. They are seldom seen by tourists, as they are very shy.

Elk have been reported from the park. Their horns have been picked up in several different localities. No authentic report has been made on elk in recent years.

Wood rats and the common rats and mice follow the line of travel.

BIRDS.

Much material of interest to visitors will be available upon the publication of the pamphlet on the birds and mammals of the park, the field work for which has been done this year by a party under the direction of the United States Biological Survey.

On account of dense shady forest condition in the lower altitudes of the park, the bird life is not abundant. Yet in these shady retreats one would not have to sit long quietly on a log before the birds would begin to make their appearance.

No attempt is here made to make a complete list. The common birds which are here the whole year are the blue jay, gray jay and camp robber, the pine siskins, juncos, wrens, chickadees, water ouzels, Clark's crows, blue grouse, ptarmigan, and leucosticte.

Summer visitors are the western robin, varied thrush, blackbird, mountain bluebird, western golden-crowned kinglet, humming birds, flickers, swallows, pigeon, quail, and northwestern sparrows.

Crows and ravens are nearly always present. The American magpie is often present in the winter months, especially in the Alpine meadows. Grosbeaks, sparrows, woodpeckers, owls, hawks, and eagles are often seen during the tourist season.

Sandhill cranes and ducks are often seen along the streams and lakes. Wild geese often in their migratory flights rest along the ponds and small lakes of the park.

FIREARMS.

As far as possible, all firearms are taken up and held at the point of entrance until the owner leaves the park.

Persons entering the park at one point and intending to leave at another with firearms in their possession are allowed to carry them through the park under seal only.

Firearms found in the possession of persons inside the park are taken up, sealed, and held until the owner leaves.

In a few cases where the desirability of carrying firearms was demonstrated permits have been granted.

GAME PROTECTION.

Notwithstanding a rigid enforcement of the rules which prohibit hunting inside the park, it is impossible to protect the park game because of the fact that large numbers of deer are driven down into the lower elevations by the fall and winter snows and are killed outside the park during the open season.

It would be desirable to create a game preserve surrounding the park for the purpose of protecting park game.

GRAZING.

During the war grazing permits were issued for the first time for small herds of cattle within the park as a war measure. H. J. Snively, jr., received such a permit in 1918, and his permit for the grazing of 500 head of cattle was renewed during 1919, but hereafter no permits for this purpose are to be issued.

MINING CLAIMS.

Mining operations are confined to claims located prior to the act of Congress of May 27, 1908, prohibiting the location of mineral claims within the national park.

The Mount Rainier Mining Co. has been operating for a number of years on the development of its claims in Glacier Basin.

Under permit from the Service they have occupied certain lands not included in their location and have constructed several buildings, a sawmill, a power and light plant, an aerial tramway, a wagon road up the north bank of White River, and have driven several hundred feet of tunnels.

The company has expended much more on its property than it has received from shipments of ore, but still feels hopeful of the development of a valuable property. The principal value of the ore is in its copper content.

The Eagle Peak Mining Co. is working toward the development of two claims in the Nisqually Canyon near the mouth of the Paradise River. This company has driven a tunnel over 400 feet in length and has installed a power plant which generates about 20 horsepower.

Sherman and Ike Evans have two claims adjacent to those of the Eagle Peak Co. which have been leased to persons interested in the Eagle Peak Co.'s claims for the purpose of mining copper ore and hauling it to the railroad at Ashford.

Neither company has shipped any ore this season, and their shipments in past years totaled only a few carloads.

MINERAL SPRINGS.

The principal mineral springs of easy access to the tourist are those located on the patented ground at Longmire Springs. Several kinds of mineralized water spring from the ground on this tract and are known as soda, iron, and sulphur springs. Some of the springs are warm, while others are cool and sparkling.

This property is now leased by the Rainier National Park Co., and the proper development of these springs is under consideration.

The Ohanapecosh Hot Springs, near the southeast corner of the park, are very hot and are noted for their curative qualities. Very little development work has been done on them, and they are accessible by trail only, 13 miles from Lewis, Wash., or 15 miles from Narada Falls. They are located just south of the park boundary in the National Forest. The small amount of land involved should be added to the park, so that it may be properly developed by the Park Service and made available for use of visitors.

A good mineral spring containing soda and iron is located close to the West Side Trail, on the South Puyallup River, near boundary post No. 16.

TRAVEL.

The dates of opening the Nisqually Road to various points for the past five seasons is shown in the following table:

To—	1915	1916	1917	1918	1919
Longmire Springs	All winter.	May 18	June 4	May 1	Apr. 23
Nisqually Glacier	May 15	June 15	June 28	May 12	May 27
Narada Falls	June 10	July 14	July 12	June 9	June 18
Paradise Valley	June 15	Aug. 24	Aug. 9	July 6	July 18

The depth of snow at Paradise Valley, which governs the date at which the road may be opened, was as follows: March 1, 20 feet; April 1, 18 feet; May 1, 19 feet; June 1, 13 feet; July 1, 7 feet; July 15, 4 feet; August 1, none.

The total number of persons who visited the park for the past five seasons is shown in the following table:

Period.	1915	1916	1917	1918	1919
To June 30	4,751	811	1,177	4,775	3,894
Month of July	11,306	4,786	8,132	12,386	14,159
Month of August	13,782	10,574	17,864	18,286	31,301
Sept. 1 to close of season	5,327	7,818	8,395	8,454	5,878
Total	35,166	23,989	35,568	43,901	55,232

Travel for the Labor Day period broke all records, the number of visitors being as follows:

Saturday, Aug. 30	2,065
Sunday, Aug. 31	3,761
Monday, Sept. 1	529
Total	6,355

The total registration up to Oct. 12 was as follows:

At the main entrance	54,697
At the White River entrance	134
At the Carbon River entrance	211
At the Ohanapecosh entrance	190
Total	55,232

Distribution of visitors:

From Tacoma	12,380
From Seattle	17,128
From other points in State of Washington	13,086
From points outside State of Washington	12,638
Total	55,232
Number entering in private automobile	46,557
Number entering by Ashford stage	1,473
Number entering by Tacoma and Seattle stage	5,200
Number entering by cars not operated by Rainier National Park Co	1,028
Number entering by motor cycle	176
Number entering by horse-drawn vehicle	79
Number entering by foot	719
Total	55,232

The number of private automobiles entering the park for the year ending October 12, 1919, was 10,434.

SPECIAL EVENTS AND PARTIES OF VISITORS.

The Northwestern Ski Club held its annual tournament at Paradise Valley on Sunday, June 29. The snow conditions were favorable and the weather was clear and fine. The tournament was attended by several hundred visitors, who enjoyed the winter sports in summer weather.

The Mountaineers, the mountain-climbing organization of the State of Washington, held their annual outing in Mount Rainier National Park. They conducted an around-the-

mountain trip in which about 100 members participated. They entered the park on July 26 and took three weeks for their trip. Camps were made at 12 different points, and a two or three days' stay was made at several of the locations in order to permit various excursions to be made. Pack horses were used to transport the equipment and supplies of the party, but the members themselves made the entire trip on foot. When camp was moved, the members had the choice of either taking the trail connecting the camps or of taking a "high-line" trip under the guidance of experienced leaders. The "high-line" route usually climbed well up the slope of the mountain, crossed the glaciers and ridges, and then descended to the new camp site. The members of the Mountaineers' party reported an excellent outing and were enthusiastic about the scenery on all sides of the mountain.

The Mazamas, the mountain climbing organization of Oregon, held their annual outing in the park, camping for three weeks on the ridge that bears their name. About 150 members took part in the outing. Many of the party climbed the mountain and made other excursions.

The following is a partial list of organizations whose members visited the park in parties varying in size from 25 to 400 or more. Some of the societies held convention meetings in the park.

The Massachusetts Forestry Association, 78 in party, July 21 to 24.
Order of Eastern Star, 400 to 500 in party, July 27.
West Coast Lumbermen's Association, 200 to 250 in party, July 29 and 30.
Association of Western Confectioners, 87 in party, August 5 to 7.
Knights of Pythias, 300 in party, August 10 and 11.
Brooklyn Daily Eagle, party of 125, August 8 and 9.
Travel Club of America, party of 25, August 9 to 12.
National Editorial Association, party of over 300, August 13 and 14.
Boy Scouts of Seattle, party of 30, August 16 to 25.
Washington State Bankers' Association, 450 in party, August 12 to 14.
Rotary Club of Seattle, August 14 to 16.
Seattle Chamber of Commerce, August 22 to 24.

MOUNT RAINIER.

In no previous year have so many persons reached the summit of the mountain. The guides of the Rainier National Park Co. conducted more than 30 trips to the top, and 278 persons took part in these trips. A small percentage of those that started did not complete the trip. In addition to this number, about 80 members of the Mazamas reached the summit, so that in all more than 300 persons have successfully climbed the mountain this year.

In order to commemorate the camp site from which Stevens and Van Trump made the first successful ascent of the mountain in 1870, the Mountaineers' plan to erect a stone bench or seat facing the mountain on the camp site, near the head of Sluiskin Falls. The National Park Service has approved the plans for this monument.

TRANSPORTATION SERVICE.

The Rainier National Park Co. operated throughout the season on a regular daily schedule standard seven-passenger touring cars from Seattle and Tacoma to the park. Twelve-passenger auto busses from Ashford to the park and both seven-passenger and twelve-passenger cars from point to point within the park. This company also furnished standard seven-passenger touring cars for the exclusive use of private parties to and from points within the park.

HOTEL AND CAMP ACCOMMODATIONS.

Rainier National Park Co., organized in March, 1916, to operate hotel, camp, and transportation service in the park, has completed its fourth season.

The following hotels and camps were operated during the 1919 season by this company:

National Park Inn, at Longmire Springs.—During the winter months this hotel was in charge of a caretaker, and limited service was given to such visitors as reached Longmire Springs. The hotel was formally opened for the season on Saturday, June 14, and remained open until September 15. This hotel has 36 sleeping rooms.

There is, in addition, a very attractive clubhouse, or assembly room, built of pine logs, which is used for dancing and other forms of amusement. Water for drinking and domestic purposes is obtained from a pure stream on the slopes of Rampart Ridge. Water is taken from the Nisqually River for the operation of an electric-light plant and refrigerating plant, which also supplies electric light to all Government buildings at Longmire Springs.

National Park Inn Annex, at Longmire Springs.—This hotel was built in 1916 and is located on patented land. It was formerly operated by the Longmire Springs Hotel Co., but this year the Rainier National Park Co. leased the property and operated the hotel in connection with the National Park Inn. The hotel is a two-story structure, with 17 sleeping rooms, some of which have private bath. There are 16 bungalow tents and a number of framed tents, which bring the total sleeping capacity to about 250.

Paradise Inn, in Paradise Valley.—This hotel was built in 1916 and opened July 1, 1917. The framework of the building is entirely of weathered logs, from the Silver Forest near by. These logs show entirely to the ridgepole in the big lounging room, which is 50 by 112 feet. The dining room is practically of the same size.

There are 41 sleeping rooms in the building and about 100 bungalow tents grouped near by. The room and bungalow-tent arrangement provides sleeping quarters for 450 guests, and the dining room and kitchen equipment is capable of serving meals to 700 or more people. The service at Paradise Inn has been kept up to a high standard notwithstanding the high cost of labor and food supplies and the fact that many times during the season it has been filled to overflowing. The inn was opened for the season on Saturday, June 28, and kept open until September 15, and after that date informal service was offered for a number of weeks, as long as weather permitted access to Paradise Valley.

Paradise Camp.—This camp is located on the ridge above Paradise Inn. It consists of an à la carte lunch pavilion and a number of tents equipped with beds, springs, and

mattresses. The object of the camp is to furnish accommodations to those wishing something simpler and less expensive than is offered at Paradise Inn. In order to accomplish this purpose, the Paradise Camp is operated in a most flexible manner, so that visitors may obtain as much or as little as they desire. They may rent the tents partly or completely furnished and either take their meals at the lunch counter or do their own cooking by an open camp fire, fuel for which is furnished by the company. Campers' supplies are sold at the camp, so that patrons may be governed by their own wishes in choosing their manner of living.

In all, the Rainier National Park Co. can furnish sleeping accommodations for 1,100 to 1,200 people in the hotels and camps.

The Glacier Camp, near the Nisqually Checking Station, was not operated this year, as there was not sufficient demand for service at that point.

A camp in Indian Henrys Park was maintained by the Cooperative Campers' Association, of Seattle, for the use of their members from July 4 to August 30.

PUBLIC CAMP GROUNDS.

For the accommodation of visitors who bring their own tents, beds, cooking utensils, and food supplies, free public camping grounds are provided at Longmire Springs, Van Trump Camp, and Paradise Valley. These grounds have been cleaned up and supplied with water, sewers, and sanitary toilets.

There are other camp sites, located conveniently to the road, where camping is permitted and encouraged.

SERVICE STATION.

A concession was given this year to the Standard Oil Co. to operate a service station at Longmire Springs and sell gasoline, oils, and similar motor supplies to the public. The company built an attractive building, under plans approved by the National Park Service, and started operation on June 27 and continued throughout the season. The station rendered very satisfactory service and met with a large demand.

INFORMATION BUREAU.

A bureau of information was maintained in the office of the superintendent at Longmire Springs for the purpose of answering the many inquiries, directing visitors to the points of interest, distributing the general information circulars of this and other parks, and selling the Government maps and publications relative to the park.

PLANS FOR DEVELOPMENT OF MOUNT RAINIER NATIONAL PARK.

At the present time the only part of the park that is accessible to the average visitor is the southwestern corner, tributary to the Nisqually River. The area that is thus developed is estimated at 5 per cent of the total area of the park.

The other portions of Mount Rainier National Park are equally attractive and contain giant forests of fir and cedar, beautiful mountain parks, gorgeous with wild flowers, many glaciers even larger and longer than those on the south side of the mountain, fascinating streams, leaping waterfalls, and sparkling little lakes, and from every vantage point the majestic peak of Mount Rainier rises as the dominating spirit of the region, its lofty summit resplendent with its crown of eternal snow and ice.

The most logical and feasible routes of approach to the park are along the valleys of the principal rivers that spring from the glaciers of Mount Rainier. It is an interesting coincidence that a large and important stream flows from the park at each of its four corners. These streams are the Nisqually River, at the southwest corner; the Carbon River, at the northwest corner; the White River, at the northeast corner; and the Ohanapecosh River, at the southeast corner.

It is up the valleys of these streams that the most ready access to the park is to be obtained.

The first development has taken place along the Nisqually River, where the present road, 20 miles in length, leads from the park entrance (elevation 2,000 feet) to Paradise Valley, at an elevation of 5,500 feet.

Plans have been completed for the construction of suitable approach roads to two other corners of the park along the valleys of the Carbon River and the White River.

Carbon River Road.—Pierce County has this year voted bonds to the amount of $2,500,000 for the construction of paved roads in the county. One of the roads to be constructed and paved under this bond issue runs to Fairfax, 5 miles in an air line from the park, or about 6 miles by road location to the northwest boundary of the park. It is expected that the road will be completed to Fairfax within two years. The county commissioners have passed a resolution declaring it to be their purpose to establish and construct a road from Fairfax to the boundary of the United States Forest Reserve at the earliest possible date. This will bring an automobile highway to within 3¼ miles of the park and will create an insistent demand for the construction of a road up the Carbon River, through the forest reserve, and well into the park.

A road has been surveyed by the National Park Service up the Carbon River for a distance of 7 miles within the park, crossing the park boundary at an elevation of 1,700 feet and continuing up to an elevation of 3,000 feet. A location survey of this was made in October, 1915, and the estimated cost under conditions at that time was $7,500 per mile. The road follows the south bank of Carbon River on grades from 2 to 6 per cent, mostly through large timber, some of the trees measuring 11 feet in diameter. The Carbon River and the mountains to the north are visible from many points along the line, and on the upper portion of the road the Carbon Glacier and the north slope of Mount Rainier can be seen.

The northwest corner of the park is the one nearest to Tacoma and Seattle. These two cities now furnish almost one-half of the visitors to the park, and most of the visitors from other parts of the country come by automobile from one of these two cities. Any development along the Carbon River on a scale comparable with the development along the Nisqually should result in a large and steady travel from these two cities. The distance from Tacoma to the Carbon Glacier will be shorter by some 15 or 20 miles than the

present distance from Tacoma to the Nisqually Glacier, and the corresponding distance from Seattle will be shortened by 30 or 40 miles.

White River Road.—A good-surfaced road now runs up the valley of the White River to The Dalles, Wash., 10 miles by road from the White River entrance of the park, near the northeast corner. This is a section of the McClellan Pass State Highway, which is projected from Auburn, Wash., on the Pacific Highway, via Enumclaw, White River, Klickitat Creek, Cayuse Pass, Chinook Pass, at the summit of the Cascades, American River, and Naches River to North Yakima.

The United States Department of Agriculture, in cooperation with the State, has let a contract for the widening and improving of the 10-mile strip of road between The Dalles and the White River ranger station. This will bring a good automobile road right to the park gate. The contractor is now at work, and it is expected that this road will be completed during 1920.

For work on the east side of the Cascades funds were available, and it was expected to have the road completed to the summit by the end of 1918, but this work was temporarily postponed on account of the war.

When these two sections of the McClellan Pass State Highway are completed, there will remain an unfinished gap of 8 miles between the ranger station and Chinook Pass.

There is at the present time a road up the White River within the park for a distance of 10 miles to Storbo Camp in Glacier Basin. This road was built by a mining company for the hauling of ore and supplies. The National Park Service has widened, reconstructed, and partially surfaced the lower 2 miles and widened and reconstructed the third mile. The remaining 7 miles have at times been passable for an automobile, but as the grade of the road runs up to 13 per cent in places it is periodically inundated by the flood waters of the White River; it is of single width and not located as an automobile highway. Most of the upper 7 miles will need relocation, reconstruction, widening, and surfacing before the road will be satisfactory to the National Park Service or the traveling public as a park highway.

The elevation of the park entrance on the White River is 3,100 feet and the elevation of Glacier Basin is 6,000 feet.

State Road No. 5, or the Cowlitz-Natches Road.—The act of the Washington State Legislature establishing this road specifies that it shall begin at Riffe Post Office, in Lewis County, thence up the Cowlitz River and its tributaries, by way of Kosmos and Randle, by the most feasible route to a connection with the McClellan Pass Highway.

One feasible route for a connection with the McClellan Pass Highway is up the Ohanapecosh River to Cayuse Pass, and this route may be the one selected.

Around-the-Mountain Road.—The ultimate development of the park will require the construction of an automobile road entirely around the mountain, connecting with the various approach roads, and linking together the many forests, mountain parks, and glaciers that can now be seen only by an arduous camping trip.

This Around-the-Mountain Road may be a matter of slow development, but every new project will form a link in the chain that will encircle Mount Rainier.

Narada Falls, Cayuse Pass Road.—In 1916 location surveys were made for a road from Narada Falls to connect with the McClellan Pass Highway at Cayuse Pass. Beginning at Inspiration Point of the Government road, above Narada Falls, at an elevation of 4,582 feet, the proposed road climbs on a 3½ per cent grade to Reflection Lakes, thence along the lake shore on a level grade, thence on a 6 per cent grade past Lake Louise, and down through a series of switchbacks to the bottom of Stevens Canyon, crossing Stevens Creek at an elevation of 2,730 feet; the road then climbs on a continuous 6 per cent grade to the summit of Cowlitz Divide, at an elevation of 4,160 feet, thence on a 6 per cent grade along the eastern slope of the Cowlitz Divide to the forks of Chinook Creek and Ohanapecosh River, crossing the Ohanapecosh River, the line then follows up the west side of Chinook Creek to Cayuse Pass, at an elevation of 4,650 feet. The line is 28.5 miles long, 7.63 miles being in the Forest Reserve outside the park boundary. The scenery along this proposed road is magnificent.

On the four switchbacks entering Stevens Canyon, Mount Rainier and the Tatoosh Range are continuously in view.

From Cowlitz River to the Divide, Mount Adams is in full view. Beyond the Cowlitz Divide the road passes through some cliffs several hundred feet high overlooking the hot springs. The remainder of the line follows through timber and crosses many deep canyons and clear streams.

The estimated cost of the road was $321,275.89, or $11,276.70 per mile.

The length of this proposed road is 28.5 miles. A further extension of 8 miles would connect this road with the White River road and would complete half of the circle around the mountain. The total length of road to be constructed would be about 37 miles, and the maximum grade would be 6 per cent.

Longmire Springs, Chinook Pass Road.—In 1913 and 1914 a location survey was made for a road from Longmire Springs to Chinook Pass at the summit of the Cascades. This proposed road follows south of the Tatoosh Range via Skate Creek, Lewis, and the Ohanapecosh Rivers. For the most part it is outside the park, but has the advantage of a lower elevation, and would therefore be open for travel for the greater part of the year, but has not the scenic features of the Stevens Canyon route.

In the event that State Road No. 5 is built up the Ohanapecosh, the connection between it and Longmire Springs would be made by one of these routes. If the Stevens Canyon route is selected, the location would follow around the end of the Cowlitz Divide, but would run approximately on the level from Stevens Creek at the south boundary of the park to the Ohanapecosh Hot Springs.

With the construction of a road up the Carbon River, the desirability of a west-side road will become apparent. This will require a road some 40 miles in length, as there are numerous watercourses and ridges to be crossed.

The character of the country on the north side of the park is the least adapted to road construction, and the link from the Carbon River to the White River will probably not be undertaken until development along the other routes has been accomplished.

Nisqually Road.—The bond issue passed this year by Pierce County for road purposes provides for the completion of a paved road for the entire distance from Tacoma to the Nisqually Park entrance. The distance is 56 miles, and less than half of the road is now paved.

With the construction of a paved road to the park gate, the automobile travel to the park will increase at a rate far in excess of the present annual increase. The present yearly travel is now more than 10,000 automobiles and 50,000 persons.

During past years funds have been available for the improvement of the Nisqually River road, and the necessity is felt of continuing this improvement. It seems desirable to plan for the paving of at least the lower portion of the road as far as Longmire Springs or the Nisqually Glacier. Before the road can be paved many curves will have to be widened and the alignment improved. At a few sharp curves the grade must be lessened. These improvements are urgently needed even if the road is not to be paved. A heavy surfacing is also now needed on much of the road.

The road from Nisqually Glacier to Paradise Valley, a distance of 8 miles, is now a single-width road, and travel is allowed over it only in one direction at a time. Automobiles start from each end of this stretch of road on the hour and pass at Narada Falls, which is the halfway point. Cars must wait for the hourly opening of the gate and are not allowed to stop between stations.

The present density of travel indicates the desirability of widening all of this 8-mile stretch or at least enough of it so that it could be opened to travel in both directions.

The construction of a parapet wall should be continued until all of the road on steep slopes is furnished with this protection.

Trails.—The improvement of present trails and the construction of new trails should be continued.

The trails recently constructed have been laid out with proper consideration of grade, drainage, width, and general location. Some of the older trails are the product of necessity and are not laid out on engineering lines. As the travel over trails increases it becomes more and more necessary to continue the improvement of existing trails and to construct new ones where the location of the present trail is not satisfactory or to open up new districts not now reached by any trail and at present inaccessible except to visitors on foot.

The trails used by the greatest number of people, and therefore in need of improvement and extension, are those in the vicinity of Paradise Valley.

Some parts of the around-the-mountain trail are in need of considerable improvement in order to put them in a safe and satisfactory condition for horse and rider.

The placing of signs to guide visitors along the trails throughout the park and to furnish them with desired information should be continued on a complete and comprehensive plan.

PERSONNEL.

Superintendent D. L. Reaburn left the park on April 23, 1919, under leave of absence.

Superintendent Alex Sparrow, of the Crater Lake National Park, arrived in the park as acting superintendent on April 22 and remained until June 3.

Superintendent Roger W. Toll reported for duty on May 29 and was in charge throughout the remainder of the season.

The rangers engaged in the control of traffic and those stationed in the outlying sections of the park all performed their duty with much credit to themselves.

CRATER LAKE NATIONAL PARK.

ALEX SPARROW, Superintendent, Medford, Oreg.

GENERAL STATEMENT.

Crater Lake National Park was created by act of Congress approved May 22, 1902 (32 Stat., 202). It is located in Klamath County, in the southwestern part of Oregon, on the crest of the Cascade Mountains, and about 60 miles from the California line.

DESCRIPTION.

Crater Lake Park is approximately 13½ miles east and west and 18½ miles north and south and contains 249 square miles. The elevation varies from 5,000 to 9,000 feet. It is a broad plateau lying at the summit of the range and surmounted by numerous volcanic peaks, among them Mount Scott, Timber Crater, Red Cone, Crater Peak, and Union Peak.

Crater Lake is one of the most interesting of great natural wonders. It is remarkable not only for its position and size but on account of its deep-blue color, its clearness, great depth, the majesty of its encircling cliffs, and its wonderful geologic history.

It lies in a great basin or caldera, formed, it is supposed, by the subsidence of the upper part of a volcano, which has been named Mount Mazama. The lake is almost circular, with an average diameter of 5½ miles, and is completely girdled by precipitous cliffs rising sheer from the water to a height varying from 600 to 2,000 feet.

Crater Lake is said to be the deepest body of fresh water in America, having the remarkable depth of 2,000 feet. Soundings show the lake bottom to be largely a plain, rising in the west into several peaks, only one of which appears above the surface of the water. This is Wizard Island, a cinder cone, which reaches a height of 800 feet above the water and has a crater nearly 100 feet deep. About one-third of the lake bed is more than 100 feet below the level of Klamath Marsh, at the eastern foot of the Cascade Range. The surface of the lake is 6,177 feet above sea level. There is no visible outlet. The temperature varies little, being uniformly about 38° F.

There are many other points of interest in the park, notably three beautiful canyons, called Anna Creek, Castle Creek, and Sand Creek. In all of these, particularly the last named, are found wonderful sand pinnacles.

From Garfield Peak, which overlooks the lake, can also be seen the beautiful Klamath Lake region to the south. Glacier Peak and the Watchman are on the western rim of the lake, and Mount Scott towers to a height of about 9,000 feet near the eastern border. Union Peak affords a view of the whole park.

TRANSPORTATION.

The nearest railway points are Medford, on the main line of the Southern Pacific, 83 miles distant, and Klamath Falls, 62 miles to the south, on a branch of the Southern Pacific leaving the main line at Weed, Calif.

All first-class tickets between Oregon and California points are good via Crater Lake during the season, with addition of stage fare.

Regular daily stage service is maintained by the Crater Lake Co. from Medford and Klamath Falls to the lake. In this service three large busses, holding 12 to 15 passengers each, two seven-passenger and two five-passenger cars are used.

ACCOMMODATIONS.

Crater Lake Lodge is located directly on the rim of the lake 1,000 feet above the water. It is an attractive building of cut stone, containing about 60 rooms, and affording very comfortable accommodations for travelers.

Five miles from the lake, Anna Spring Camp is maintained at cheaper rates. There is a store here where groceries, gasoline, and other supplies are obtainable. Gasoline and motor oil can also be purchased at the three park entrances.

Throughout the park the public is allowed camping privileges in designated places, subject only to the regulations of the National Park Service.

BOATING.

Visitors to Crater Lake may enjoy boat trips, launches and rowboats being provided, trips to Wizard Island are made by launch on regular schedule, and special trips, as requested, around the island, to the Phantom Ship, and around the lake shore. Rowboats are available at all times.

On the night of September 25, 1918, a very severe storm drove some of the boats ashore, completely destroying the launch and badly damaging five rowboats. In consequence, the boat service was somewhat limited this season, as it was not possible to secure early delivery of the new boats purchased by the Crater Lake Co. Five new launches and 10 rowboats are now on hand.

FISHING.

The lake is kept well stocked with rainbow trout. Fishing is permitted only with hook and line, and the catch is limited to five in one day for each fisherman. There is good fishing also in Anna Creek, below the falls.

GAME.

Black and brown bears, the only varieties found in the park, are growing more numerous and are getting very tame. Black bears are seen almost daily in the neighborhood of the lodge and the construction camps. Pictures were taken recently of visitors to the lodge feeding a cub bear.

In 1917 a small herd of elk was turned loose in the Forest Reserve near Seven-Mile Creek, and these animals range the southern portion of the park during the summer.

Pine marten, porcupines, squirrels, chipmunks, pheasants, and numerous varieties of birds are found in ever-increasing numbers. Cougar, lynx, timber wolves, and coyotes are seen occasionally, and every effort is being made to exterminate them.

WEATHER CONDITIONS.

Even with exceptionally fine weather during the summer months, the season is short, for, on account of the snow, it is seldom possible to get into the park before July 1, and stormy weather is apt to begin in September.

The average snow fall is 14 feet at Anna Spring and much more, of course, at the lake. It is not unusual to see snow any month in the year.

There was frost nearly every night in June this year. The mean temperature for the month was 47.5 degrees; for July, 58.5 degrees; and for August, 57 degrees. Clear weather prevailed during these months.

Snow fell on September 3, and for six days it rained and snowed continuously, during which time all work was completely suspended.

TRAVEL.

By means of snow plowing and shoveling, automobiles coming from Medford were enabled to reach Anna Spring Camp on June 18 and the following day the road was open to Fort Klamath. It was not possible to run cars to the lake until June 30. The trail from the lodge to the water was covered in many places by huge snow banks, but paths were shoveled along the tops of the banks and the trail was in shape for use by July 1.

The season's travel has been the heaviest yet recorded.

Travel for the year ending Oct. 12, 1919.

Pinnacles Road	1,568
Fort Klamath Road	7,932
Medford Road	7,145
Total	16,645

Means of transportation.

Crater Lake Stage	1,034
Automobiles	15,210
Motor cycles	10
Wagons	298
Mounted on horse	56
On foot	37
Total	16,645

Motor vehicles.

Pinnacles Road	481
Fort Klamath Road	2,163
Medford Road	1,993
Total	4,637

SPECIAL VISITS.

A party of 66 members of the Massachusetts Forestry Association came to the park via Medford July 28, and left via Klamath Falls July 30.

On August 11 the park was visited by a large delegation from the National Editorial Association. Including the drivers, about 350 were entertained. Ben Olcott, governor of Oregon, and Mayor Baker, of Portland, accompanied the party.

Seventeen members of the Travel Club of America, conducted by Mr. Charles C. Heyl, arrived on August 16 and left on the 18th.

ROADS.

There are four roads in the park system, known as Pinnacles, Medford, Fort Klamath, and Rim Roads. The Pinnacles Road, 3.25 miles, connects the east entrance with the Rim Road at Lost Creek. The Fort Klamath road, 11.4 miles, connects the south entrance with the Rim Road at Government Camp, 2 miles south of Crater Lake Lodge. The Medford Road, 6.84 miles, connects the west entrance with the Fort Klamath Road at Anna Spring. These three roads have been open for travel since 1915, and are in good condition for dirt roads. The Rim Road, 35 miles, circles the lake. This road is at an average altitude of 7,100 feet and is open for travel about eight weeks during the year. This season, which was comparatively early, it was not cleared of snow until August 3, and it can rarely be used after September 30.

On account of its many scenic attractions, this road is destined to become a popular drive, but much improvement work will be necessary. During this, its first season, travel over it has been very heavy.

The total length of roads in the park is 57 miles, and the maximum grade is 10 per cent.

TRAIL SYSTEM.

The park system of trails is made up of the following: The Watchman, 3.5 miles; Garfield, 1.3 miles; Lodge to Lake, 1.2 miles; Wizard Island, 0.75 miles; Dewie, 2.05 miles; to Rim, south side, 1 mile; Anna Spring, to Rim, 4 miles; Copeland Creek, 2.2 miles; Union Peak, 4 miles; Red Blanket, 2 miles; Sun Notch, 1.5 miles; Crater Peak, 2.3 miles.

A trail of very easy grade, on which horses and burros are now used, leads from the Rim near Crater Lake Lodge to the water, a descent of 900 feet, and visitors to Wizard Island find a good trail to the crater.

There is an excellent trail to the top of Garfield Peak. The one to Watchman is a winding trail, passable for horses, and the lake is in full view for the entire distance. The Dewie Trail is passable for autos. It affords a good view of Anna Creek Canyon and Dewie Falls. An easy trail is now open to Union Peak. It is passable for light vehicles for about 3 miles; the remaining distance to the base of the peak is a good horse trail. The climb to the top of the peak must be made on foot. It is very steep, but the footing is good and the climb easy. The trail ascends 700 feet in the last one-fourth mile, but the view from the top of this peak is well worth the climb.

A trail from the Rim Road to Sun Notch was built this season. It is passable for vehicles for 1 mile and the other half mile is a very easy foot or horse trail. The best possible view of the Phantom Ship is from Sun Notch.

Another trail made this season runs from the Rim Road to Crater Peak. One and a half miles of this is passable for light vehicles; the remainder, while very steep, is practicable for horses clear to the top. From Crater Peak, a magnificent view may be had of the Klamath Lake country.

FIRE LANES.

Work was continued this season on cutting brush and clearing a fire lane along the park boundary. This work will be finished before the end of the fiscal year.

RANGER SERVICE.

The ranger force consists of seven temporary rangers; one is employed throughout the year at Anna Spring, three on mounted patrol, and three unmounted at checking stations during the tourist season.

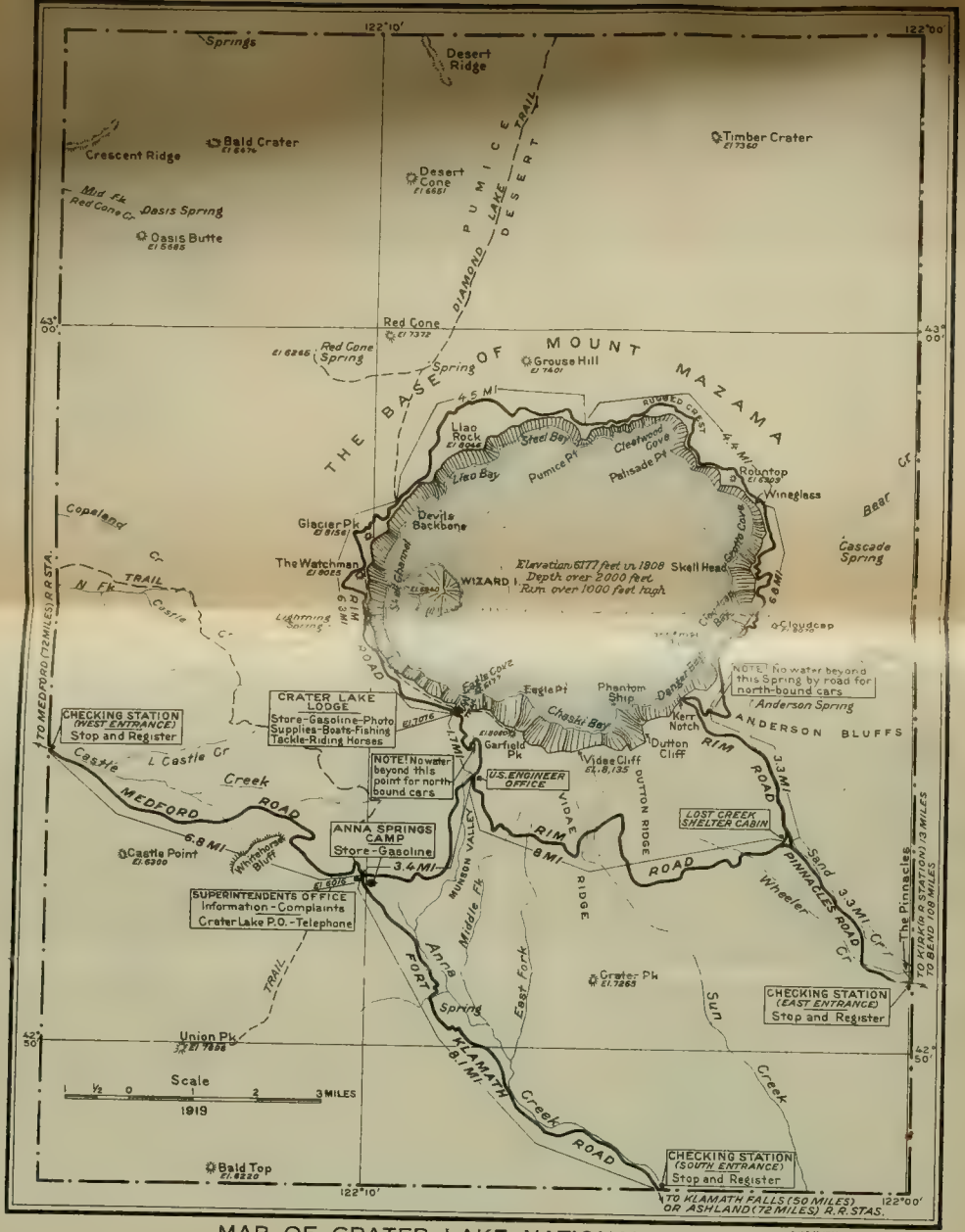
One temporary clerk-stenographer is employed during the working season.

FOREST FIRES.

This season passed without serious trouble from forest fires. An electric storm of short duration occurred on July 18, which started a few fires in the surrounding country, but missed the park. Electric storms on August 6, 13, and 19 started fires in the park, but these were brought under control without difficulty. One fire in the Forest Reserve west of Union Peak got across the park line, doing little damage, as it was confined to snow brush on an old burn. Rain and snow coming early in September did away with all danger from fire.

WATER SUPPLY.

A water system has been installed for the convenience of campers at the rim of the lake. Prior to the installation of this system no water could be obtained at the rim, and the nearest camp ground was about a mile distant from the lake. The new system has justified itself in the comfort provided for visitors and the growing popularity of the camp ground.



MAP OF CRATER LAKE NATIONAL PARK

TELEPHONE SYSTEM.

There are 54 miles of telephone line in the park and 14 miles of line from the east entrance to Kirk, at the end of the railroad. The west entrance is connected with a line to Prospect, 18 miles, in which the Park Service has an interest. This line is valued principally for fire control. Twelve miles of it is through the Forest Reserve, and the Forest Service maintains 9 miles of it.

All service over the park lines, including that to Kirk and Prospect, is free, and, considering the temporary nature of much of the line, the service is very good.

The park system connects at the south entrance with the Klamath Telegraph and Telephone Co.'s line to Fort Klamath, 9 miles. A three-year contract has been made with this company, whereby they have free service over all park lines, in exchange for which they maintain 8 miles of line from the south entrance to Anna Spring for 10 months and 5 miles of line from Anna Spring to Crater Lake Lodge for 4 months each year. They also keep telephones in repair on this line and give free service for all Government business between the park and Fort Klamath.

TRANSFER OF WORK.

On June 30 the War Department, which had been in charge of road construction in the park for several years, transferred its work, supplies, and equipment to the Park Service, which now has entire charge of all work within the park.

RECOMMENDATIONS.

A large warehouse should be constructed where the equipment that is now distributed in small warehouses about the park and outside could be assembled, repaired, and kept for issue.

A garage and machine shop are needed to properly care for motor vehicles.

A stable to accommodate 40 horses and 20 tons of hay should be constructed; also a building to be used as kitchen, mess hall, and sleeping quarters for 40 employees. All of these buildings should be located at Anna Spring, the logical location for park headquarters.

The scarcity of labor and the short season would make it impossible to complete these buildings during one season, but the warehouse and garage should be built without delay.

An archway should be placed at the west entrance to the park.

A rock retaining wall should be built along the rim of the lake in front of the lodge to prevent danger from erosion and to provide support for a gravel walk.

A rock retaining wall is needed to support the road around Anna Spring.

A trail practicable for light vehicles should be built from the Rim Road to the north boundary of the park; this could later be extended to Diamond Lake.

A clerk-stenographer is necessary for the entire year. While it might be possible to get along without one for a few months in the winter, the season is practically gone before a new clerk becomes sufficiently familiar with the work to be of much assistance. The season is too short for the superintendent to remain inside doing clerical work when better clerks may be obtained for less money.

The attention of the Service is invited to our recommendation of last year respecting the extension of the park to include Diamond Lake.

A glance at the park map will reveal the fact that the three entrances to the park are all near the south. This necessitates north or south bound tourists taking a back track to get in or out of the park. We should have a northern outlet to connect with the Bend Road, thus enabling tourists to visit both Crater and Diamond Lakes without going materially out of their way to do so. The area involved is all in the forest reserve, and there is practically no timber of any commercial value.

According to forest reserve data, there is grazing for only 112 head of cattle and 1,460 head of sheep and their increase for 90 days.

As a result of much hunting outside the park more bear and deer have appeared in the park this year than ever before, and if the game is to be saved from extermination in this locality the game preserve must be enlarged.

WIND CAVE NATIONAL PARK.

ROY BRAZELL, Superintendent, Hot Springs, S. Dak.

GENERAL STATEMENT.

The Wind Cave National Park was created by the act of Congress approved January 9, 1903 (32 Stat., 765), which reserved for park purposes a tract of land comprising 10,522 acres, which tract was increased in 1912 by purchase of 377.05 acres of adjacent tracts for game-preserve purposes, the total area of the park now being 10,899.22 acres.

The park was established, primarily, to preserve for posterity the natural beauties and wonders of the Wind Cave, and gets its name from this cave, the cave in its turn getting its name from a peculiar, intermittent draft of air blowing in or out at its entrance.

The park is located in the southwestern corner of South Dakota, 36 miles from the south boundary and 24 miles from the west boundary of the State, in the semimountainous region of the southern Black Hills, and is approximately 4 miles square.

The land within the boundaries of the park is about evenly divided between rolling prairie country, which offers excellent grazing facilities, and a mountainous area covered with a good growth of pine timber, affording ideal natural shelter for game and stock during the winter months. The altitude at headquarters is 4,030 feet, but parts of the mountainous region near the western boundary attain a height of something over 4,700 feet.

The park is under the direct control of a superintendent, who is assisted by one park ranger, these being the only regular employees on duty in the park, though during the tourist season other rangers are employed for guide service to conduct visitors through the cave.

THE CAVE.

Somewhat north of the center of the park is the entrance to one of nature's most wonderful and baffling bits of handiwork—the Wind Cave. The cave is by far the most interesting feature of the Black Hills.

It is claimed by people who have traveled extensively that this cave has more miles of explored passages than any other cave in existence. The trails within the cave have been developed to a certain extent, and three routes are made accessible to visitors by the working out of passageways and the installation of stairs and ladders. The three routes open to the public to-day are known as the "Garden of Eden," the "Fair Grounds," and the "Pearly Gates," being a short, medium, and long route, respectively.

The cave itself is, of course, the chief attraction of the park, and consists of a series of long, narrow passages, and innumerable chambers of various shapes and sizes, one of which is said to be the largest natural underground chamber in the world. To appreciate the cave one must see it, for it is practically indescribable. A vague general idea of it can be formed by comparing it to a gigantic sponge measured in dimensions of miles instead of inches, as the holes or passages extend in all directions and at all angles.

The cave was formed by the chemical reaction of hot water on the limestone composition, some of the fantastic formations having been made by the deposit left by receding hot water. This deposit resembles closely the deposit found on the inside of a used teakettle.

Among the formations of the cave may be found calcite crystals, exposed geodes, stalactites, stalagmites, quartz, and a formation called frostwork, and boxwork, and the usual mineral-bearing rock.

The stalactites and stalagmites are very small and not very numerous, as they require considerable moisture in their formation, and this cave is classed as a dry cave. There is, however, a spring and a miniature lake in one of the upper levels of the cave, but aside from this it is without moisture except for condensation of the atmosphere and here and there a little seepage from the surface. It has been aptly said of Wind Cave that the various formations within it are a most wonderful exhibit of diversified beauty and inimitable work of nature.

The most interesting feature of the cave is a peculiar draft of air blowing in or out at its entrance. This current of air has no regularity either as to direction or velocity. There are several theories as to where this wind comes from, but the one that is given the most credence is that it is caused by atmospheric pressure from above, and I find it to be a very good barometer, indicating a change in the weather from four or five hours to a whole day in advance. If the barometer is falling outside the air will be coming into the cave, indicating a change for the worse, and if it is rising outside the air will be going out of the cave, indicating a change for the better. At times the wind will rush out of the cave with such terrific force that it requires the strength of two men to open the door so that one may get into the cave. At times it is perfectly calm. After getting into the cave two or three hundred feet one never notices the draft of air.

The extent and number of the various crevices, cross passages, and chambers which make up the cave no one knows nor can anyone intelligently guess, though we do know that the part now open to the public is a very small fraction of that part which has been explored but not surveyed. Beyond this the wildest guess is permissible. Old guides, who have spent years in the cave, claim to have explored over 100 miles of passages.

RAILROAD FACILITIES.

The entrance to the cave is located about 12 miles north of Hot Springs, which is our main railroad city. The Chicago, Burlington & Quincy and the Chicago & Northwestern Railroads run branch lines to Hot Springs, and together have built a near little union depot to handle the passenger traffic. Most of the people traveling by rail who visit the cave motor from Hot Springs, coming by hired conveyance from that city, though other accessible railroad towns are Buffalo Gap, 12 miles distant on the Chicago & Northwestern Railroad, and Pringle and Custer, 9 and 22 miles distant, respectively, on the Chicago, Burlington & Quincy Railroad. Hot Springs is but an overnight ride by railroad from Omaha, Denver, or Billings.

Our post office address is Hot Springs, S. Dak., the mail being brought to the park by our transportation concessioner.

VISITORS.

This year we have established a new record for number of visitors. The park and the Black Hills country generally have had the biggest run of tourists this season they have ever experienced.

There were 26,312 visitors to the park during the season just ended. Of this number 7,578 made the trip through the cave. The number of private automobiles in the park was 8,240.

A large percentage of this increase in number of visitors is directly chargeable to the publicity that has been and is being given to the park and to the Black Hills. An organized campaign should be inaugurated and some good system of publicity energetically adhered to, for the bulk of our visitors come from this and near-by States, which indicates that we are not well enough known away from home. However, practically every State in the Union was represented by visitors to the cave again this year, as well as many foreign countries, but the following percentages show from which States most of our visitors come:

South Dakota, 47 per cent; Nebraska, 26 per cent; Iowa, 8.6 per cent; Wyoming, 3.2 per cent; North Dakota, 2.5 per cent; Illinois, 2.1 per cent; Minnesota, 2.1 per cent; Montana, 1.17 per cent. All other States represented by less than 1 per cent.

With the proper exploitation the number of visitors should easily be doubled next season. Something should be done to let the tourists from afar know where we are and what we have to offer them. Of course, it is not necessary to mention to any National Park Service employee the fact that after the tourists arrive they must be treated right. Courtesy and service—first, last, and always. The tourist is on his vacation. Let's help him have a good time.

Each trip through the cave requires from two to three hours, and but two regular trips are made daily—9 a. m. and 2 p. m. It has been the custom to discontinue the forenoon trip during the period from October 1 to April 30.

The signs informing the public of the scheduled hours of entrance to the cave which were installed at various points on the popular cross-country highways last year have been decidedly beneficial to the motoring tourists, and more of this kind of work should be done, as many visitors are disappointed upon arriving at the park too late to enter the cave and are very much annoyed at the inconvenience of having to wait for the next regular trip or miss seeing one of Nature's most interesting bits of handiwork.

We were seriously handicapped this season by not having a sufficient number of rangers for guide service to properly handle the visitors.

ROADS AND BRIDGES.

The main road through the park is about 6 miles in extent and constitutes a part of the Denver-Deadwood Highway, the Black Hills portion of which is noted for its panorama of beautiful scenery.

The park section of this highway has always been considered the best road in the hills, until recently, when lack of funds has caused us to neglect it to a certain extent, and it is now barely in the mediocre class. As a whole, we have the best of road building material, and an ideal, natural roadbed, the soil having considerable rock, sand, and gravel mixed with it. All of our construction work on the road for the past five years has been done with a view to making a permanent, hard-surfaced road as soon as funds are made available for that purpose.

The three remaining bridges on the park are, and have been, in a very poor state of repair, being almost to the stage where they should be condemned, but here, too, we have been hampered by lack of funds. Suffice it to say that they must, in the very near future, be replaced with new ones or substituted by earth and rock fills. The culverts on the park are in good condition, and those that were installed recently are of a permanent nature.

Minor repairs have been made on the bridges, and a decided improvement was made this season on our road near the south boundary of the park.

BUILDINGS.

The park buildings consist of a superintendent's residence, which is of stone, with a frame addition, and is modern in that it has a furnace, bathroom, and hot and cold running water; and a good frame barn with hay loft and carriage room and stalls for five horses; a three-room frame administration building equipped with inside toilets and lavatories; an open auto shelter, a camp pavilion, building over entrance to cave, an ice house, and a blacksmith shop.

The building over the entrance to the cave and the blacksmith shop are in very poor condition and very unsightly. These should be removed and new ones erected in their stead. The one over the entrance to the cave should be an attractive stone affair.

OTHER IMPROVEMENTS.

At the superintendent's residence and at the administration building are modern septic vaults for the reception of sewage. These vaults have worked successfully without attention since their installation in the spring of 1918.

We have about 3 miles of drift or cattle fence, three wire; a small pasture near headquarters, four wire; cement walks, drives, and crossings, and an ornamental iron fence around the grave and statute of the original guide and explorer of the cave, and some substantial, ornamental guard rail. About a mile south of headquarters is a dam which, with sufficient rainfall, creates a lake covering about 3 acres. There is also a private telephone line connecting park headquarters with the game preserve office, about 2 miles to the north.

WATER SUPPLY.

The source of our water supply for use at the park headquarters is a spring located inside the big-game inclosure about a half mile west of and 150 feet higher than the superintendent's residence.

A ¾-inch galvanized-pipe line conducts the water from the spring to a cement and rock reservoir, which is built underground and has a capacity of 450 barrels. It is located near headquarters and about 70 feet higher than the buildings. Water is conducted by gravity from this reservoir to the residence, administration building, drinking fountain, and various hydrants on the lawn and in the street. Water is excellently pure and clear, though the supply is such that we dare not use it as freely (for lawn, etc.) as is desirable.

STREAMS.

There is a running stream which skirts the park on the north, coming within the boundaries at various places. This is the only permanent running water on the park. There are three springs at various points on the park which, if improved a little, would supply sufficient water for several hundred head of cattle. One of these springs, particularly, is especially reliable and should be improved and protected.

BIRDS.

Bird life on the park is noticeably on the increase, particularly those classed as game birds. These seem to have an uncanny knowledge of the fact that they are protected on the park and are becoming very tame.

More than 60 varieties of birds are found here at some time of the year, some of which stay with us the year round, though most of them are migratory. The yellow-legged prairie chicken and pin-tailed grouse are quite plentiful, and we have a few quails, pheasants, and ducks in season

The magpie, a very pretty bird itself, is the worst enemy to bird propagation we have to contend with, as it is given to robbing other birds' nests of both the eggs and the young.

NATIONAL GAME PRESERVE.

In the northwestern corner of the park a national game preserve has been established under the provision in the act making appropriations for the Department of Agriculture for the fiscal year ended June 30, 1913, approved August 10, 1912 (37 Stat., 293), as follows:

"For the establishment of a national game preserve, to be known as the Wind Cave National Game Preserve, upon the land embraced within the boundaries of the Wind Cave National Park, in South Dakota, for a permanent national range for a herd of buffalo to be presented to the United States by the American Bison Society, and for such other native American game animals as may be placed therein, the Secretary of Agriculture is authorized to acquire by purchase or condemnation such adjacent lands as may be necessary for the purpose of assuring adequate water supply, to inclose the game preserve with a good and substantial fence, and to erect thereon all necessary sheds and buildings for the proper care and maintenance of the said animals, $26,000 to be available until expended."

The game preserve is located on the most desirable part of the park and comprises about 4,000 acres, which are inclosed by a woven wire fence 88 inches high, with 24 line wires and stays every foot. Cedar posts are used and are 16 feet apart on the level land and 12 feet apart on the rough ground. Fence was built in 1914 under the supervision of F. M. Dille, inspector for the Biological Survey, and is said to be rabbit tight and buffalo strong. In many places dynamite had to be used to blast the postholes out of solid rock.

At present the animals within the inclosure number approximately 54 bison, 100 elk, and 21 antelope. In addition to these there are a few native black-tailed deer in the inclosure, that were accidentally caught on the inside when the fence was built. The deer are quite plentiful on the park outside of the game inclosure, and several small herds have been sighted this summer at various points on the park.

The game within the inclosure is doing very well and is increasing quite rapidly, except the antelope, which are just nicely holding their own. However, even that is very gratifying, as in most places where they have been kept in captivity I am informed they do not even hold their own.

PREDATORY ANIMALS.

The coyote, bobcat (lynx), skunk, and porcupine are very common in the park, and the weasel and mink are present in small numbers. Rodents are very numerous, and some of them may properly be classed as pests. Due to the persistent efforts of the game-preserve authorities and the park management, assisted by the adjacent ranchers, the first-named animals are becoming less numerous. To quote from the annual report of Mr. A. P. Chambers, warden of the preserve: "There were 13 coyotes and 7 bobcats caught on the park this year." Mr. Chambers assisted Mr. Troy Beach, Government trapper, sent here by the Department of Agriculture, in exterminating the predatory animals.

GRAZING.

The grazing privileges granted to the neighboring ranchers have been one of the park's main sources of revenue, and with the exclusion of a valueless class of horses heretofore allowed to range on the park has worked a decided economic gain, the increased production of beef helping to represent this community as having "done its bit" during the war. Owing to an exceptionally dry season this year our range is very short, and in all probability we will have to decrease the number of cattle allowed to graze on the park next season.

CONCESSIONS.

The park allowed the following concessions during the year just ended:

John Aaberg, T. B. Quigley, August Sanson, Paul E. Martin, Albert Aaberg, Elvin Aaberg, John Raver, Smith Brothers, D. L. Hayden, Joe Telander, J. L. McAdam, grazing permits; Bert Underhill, transportation concession; Douglas Natural Color Film Co., Famous Players Lasky Co., A. S. Lindstrom, motion-picture concessions; A. A. Underhill, souvenir concession.

REVENUES.

Revenues of the park from all sources for the fiscal year ending June 30, 1919, aggregate $2,533.15.

PLATT NATIONAL PARK.

THOMAS FERRIS, Superintendent, Sulphur, Okla.

GENERAL STATEMENT.

By acts of Congress of July 1, 1902 (32 Stat., 641) and April 21, 1904 (33 Stat., 220), 629.33 and 218.98 acres, respectively, at the town of Sulphur, Oklahoma, then Indian Territory, were segregated as the "Sulphur Springs Reservation," which designation, by joint resolution approved June 29, 1906, was changed to "Platt National Park."

The park, with a total area of 848.22 acres, extends in irregular form a distance of approximately 3 miles from northeast to southwest along Travertine Creek, including a portion of Rock Creek, into which Travertine empties, and it has a circuit of 9 miles.

There are within the park a number of known mineral and three nonmineral springs. The principal group of these springs are the Bromide, Medicine, and Sodium-Chloride Springs in the extreme western part of the park; the Beach, Pavilion, and Hillside Springs in the north-central portion of the park; and the Sulphur-Bromide, Black-Sulphur, and Wilson Springs in the south-central section of the park. Sulphur springs predominate.

The Antelope and Buffalo Springs, nonmineral in character, are situated at the extreme northeastern end of the park, with an elevation of 1,080 feet above sea level at the Antelope Spring and 1,078 feet at the Buffalo. They have an approximate discharge when normal of 5,000,000 gallons daily into Travertine Creek and are the source of this creek. Since the year 1911, however, they have not been altogether normal. In that year the springs both ceased to flow altogether, but resumed their flow in 1913, never at the normal rate, however. They continued to flow until January of 1918, when they stopped again and have been dry since that time. I shall discuss this more fully under another paragraph in this report.

A number of other springs in the bed of Travertine Creek, but some distance down the stream, are still flowing and provide a meager flow of water in the bed of this creek.

The Medicine Spring and the Sodium-Chlorid Spring are comparatively recent discoveries, but they have both been confined and protected from the creek overflows and piped into the Bromide Pavilion for distribution to visitors. This improvement will also be discussed in a following paragraph.

VISITORS.

According to a special report handed me by my predecessor, Col. R. A. Sneed, covering details which occurred in connection with his administration of the park, of which this report will be principally composed, it appears that there is no possible way of getting at an accurate count of the number of visitors who come to the Platt National Park annually, and only an estimated number can be given. Col. Sneed advises that nothing but an estimate as to the number of visitors to this resort has ever been shown in the annual report. It appears he made an effort at one time to get the hotels to keep an accurate register of the visitors stopping with them, but that the hotels, with the exception of the larger ones, fail to keep a register of their guests. Most of them do not have desk clerks, and only the guests register who do so of their own volition. Col. Sneed advises that even if his effort toward getting a complete register of the guests of the hotels had been successful, there are still numerous private homes and small rooming houses where visitors stop, and that it would be almost a physical impossibility to get any figures covering these.

It also seems impossible to get any data covering the numbers of people who come in here from the railroads, as a great many visitors come in their own cars, and the former superintendent advises that he has not yet solved the problem relative to giving any accurate figures covering this feature.

There is no one entrance to the park, and if there was the park appropriation has not been sufficient up to this time to permit of the employment of a gatekeeper who could keep a register of the visitors who come here.

Col. Sneed advises that so far as he has been able to observe there has been a falling off in the number of persons who have visited the park during the year just ended, giving as his estimate that during the fiscal year just past there have not been to exceed 18,000 to 20,000 visitors here. I am not giving this as a final figure of tourist travel for the season, but I should estimate that at the end of the season, taking the figures above as a basis up to that time, that there have been approximately 25,000 visitors to the park during the time intervening since the date of the last annual report.

The former superintendent seems unable to account for the reduction in tourist travel within the park, unless it could be due to the unsettled condition of the country after the signing of the armistice or the weather conditions. It seems that it has been so uniformly cool during the present season in the section of the country from which the park draws its visitors that they have probably not felt the necessity for hunting cooler places, and last season the surrounding country experienced an unusual drought, which might have kept many visitors at home at that time.

There were registered in the park office during the fiscal year 762 visitors, who came into the park and camped for three days or more.

As shown by the records of the laborer at the Bromide Springs Pavilion, the visitors there during the year just ended numbered 114,762. This total is made up from day to day of visitors and resident citizens who make repeated trips to the springs, and does not represent as many individuals.

During the year a total of 32,735 gallons of Bromide water was taken from the springs by visitors, as well as 12,875 gallons of Medicine water and 2,521 gallons of the Sodium-Chlorid water.

There were shipped from the springs 4,790 gallons of the Bromide, 995 gallons of the Medicine, and 65 gallons of the Sodium-Chlorid waters, making a grand total of all these waters removed from the spring during the fiscal year of 53,981 gallons. Last year there was a total of 66,987 gallons of these waters taken from the spring; hence it will be seen that 13,006 gallons less water was consumed by the public during the present year than the year previous. This would in itself indicate that there were fewer visitors to the park during the year covered by this report than during the year previous.

WEATHER CONDITIONS.

In August of 1918, Mr. J. P. Slaughter, meteorologist, of Oklahoma City, in charge of the Oklahoma section, Weather Bureau, came to the park and installed near the park office a thermometer shelter and rain gauge for the purpose of making observations regarding the weather in this locality. It had been the habit of this office for some years past, it seems, to take a record of the thermometer readings three times each day, but the thermometer was not sheltered, and often the readings were far from correct. The Weather Bureau apparatus was installed on August 9, and the thermometers set that afternoon, and readings were begun on the following day.

MONTHLY SUMMARY.

Below I give you a summary covering the weather conditions as they have existed here since the installation of the local bureau:

Month.	Mean temperature.	Mean maximum.	Mean minimum.	Rain in inches.
August	26.4	100.0	73.5	2.14
September	26.0	83.6	57.3	4.15
October	22.9	80.7	58.3	4.37
November	17.9	59.9	41.6	2.56
December	22.1	55.9	33.8	3.92
January	22.0	52.7	30.6	1.21
February	18.7	48.2	29.4	2.39
March	24.5	66.9	40.2	2.18
April	22.9	73.4	50.5	3.40
May	19.3	76.3	56.9	5.35
June	18.2	83.2	63.0	3.67
July	20.0	90.0	69.7	3.81

From this table it will be noted that since the installation of the local bureau there has not been a single month during which we have not had at least an inch of rain, and during the interval of less than a year there has been a total rainfall of 39.15 inches. The warmest temperature registered since the 10th of August last year was 106 on two days only, while the lowest temperature was 9 degrees above zero on the 3d and 4th of January. The two warmest days of the year were on the 19th of August and the 15th of September.

BROMIDE PAVILION.

When the former superintendent built the new Bromide Pavilion, it appears there was not sufficient funds available for this purpose to enable him to put all the finishing touches to this structure that he was inclined to make here. The waters from the Bromide, Medicine, and Sodium-Chlorid Springs are all distributed to the public from this pavilion, all of them being pumped from the springs into containers within the spring house. It was necessary, because of lack of funds when the pavilion was built, to install therein temporary facilities for dispensing these waters. During the year just ended, however, he replaced this temporary arrangement with a permanent cement stand 5 feet wide by 16 feet in length, with a cement trough attached, which drains into the creek below the pavilion. To this stand he attached three pumps of a like make, which bring the various waters from the springs up into three earthenware containers of 20 gallons capacity. The containers have covers and are labeled under the glaze "Bromide," "Medicine," and "Sodium-Chlorid." They are also provided with strong rabbit-eared, self-closing brass bibs, so that very little water is wasted, but the trough below the stand takes care of whatever wastage there may be, and provides a place to catch whatever water the visitors may throw from their cups. This enables the keeper of the spring house to have the pavilion always neat in appearance. The pumps and containers on the stand are arranged at equal distances apart, and across the pavilion on the opposite wall has been painted the analysis of each of the spring waters dispensed from this pavilion, each analysis appearing opposite the container which holds that particular water. This work has all been done artistically and is said to be quite an improvement over the old conditions which have existed at this location in the years gone by. I should say that this pavilion might be called a finished piece of work if some of the woodwork on the interior could be stained. The improvements at this location have all been in the nature of permanent developments and show conclusively that much careful thought and attention has been devoted to this work by the former superintendent of this park.

BROMIDE BRIDGE AND APPROACHES.

Before the flood of January, 1916, the Bromide Suspension Bridge spanned Rock Creek, so that persons crossing the bridge entered the spring house directly from the bridge; but after this had been washed away by the flood the department engineer, who selected a site for the new bridge, decided that the safest foundation was some distance up the stream from the spring house, where a turn in the creek throws the flood waters of the stream against the rock cliff instead of against the earth foundation at the south end of the bridge. It was the opinion of the engineer that this would reduce to a minimum the likelihood of the stream ever undermining the foundation at the south end of the bridge, as he thought might have been the case relative to the south end of the old suspension bridge, where another turn of the creek had thrown the waters against the earth foundation at that location and where it had probably been loosening the dirt for some years past. Hence the new Bromide Bridge was located at the site upstream from the pavilion. Necessarily, this change of location made requisite the building of some kind of a walk way along the cliff side from the pavilion to the north end of the bridge and building an approach at the south end. During the year just ended the superintendent completed the approach at the south end of the bridge, constructing it of cement walls filled in with rock and gravel in the center and with a cement floor on top. This approach is 6 feet high at the top and 18 inches deep at the lower end. It is 37 feet long by 10 feet 4 inches wide at the top and 6 feet 8 inches at the lower end.

Due to the delay in letting bridge contract and locating this bridge, there was not sufficient time left before the end of the fiscal year for which the storm-damage appropriation was made to enable the superintendent to foresee the necessity for these approaches and provide for letting contract for building same from the $10,000 appropriation available for repairs to storm damages by the time the fiscal year closed, which made it necessary to provide a temporary plank walk along the cliff side between the pavilion and the north end of the bridge. It appears to have been his intention when

funds were available to make a permanent walk way at this location, building a rock retaining wall along the foot of the bluff to hold the walk up and prevent its being washed by the waters of the creek. Up to this date, since the construction of the bridge there has not been an appropriation for the park of sufficient magnitude to justify him in undertaking this project; hence the temporary walk is still in use. I believe this walk should be built with the necessary rock retaining wall as its support, but it will be an expensive piece of work if properly and artistically done, as should be the case in all improvements made in the national parks. I include in my estimate for submission to Congress a recommendation for the sum necessary to do this work, which the former superintendent thinks would probably be sufficient for its completion.

I notice since my own administration of the park began that cement sidewalks had been built in the little Bromide Park which led up to the south end of the old suspension bridge, and while I do not think it is necessary to remove these walks I believe new ones should be laid to connect these walks with the south approach of the new bridge. This would increase the probable cost of the walks leading to this bridge some $250, and I am adding this amount to Col. Sneed's estimate for this purpose.

CLIFFSIDE TRAIL.

This trail was constructed by former Superintendent A. R. Greene in the latter part of 1908 and consists of a footpath leading from the Pavilion Springs west across the park, and thence along the Bromide Cliff, descending by way of a cement stairway to the Bromide Spring. The trail crosses several ravines which have been spanned by small wooden bridges since its construction. Col. Sneed advises that it has been some years since any great amount of work on either the trail or the little bridges has been done. It was his intention to thoroughly repair both during the year just ended, but it appears there have not been sufficient funds available to do this and other work on the park which was more necessary, so the trail was merely cleared off and some of the worst bridges replaced with new ones. The new bridges were constructed of new lumber and painted. Further work should be done on this trail, and I am making recommendations along this line.

FENCING.

During the fiscal year past the superintendent purchased about 2,000 new oak posts for the purpose of repairing the park fences, some of which had not been repaired since it was built some 11 years ago. The old fence posts had rotted, and many of them were entirely gone. These were replaced, and the fencing was thoroughly repaired as far as it was possible with the funds available.

Col. Sneed advises that he has had in mind for some years building an iron fence of two rails of 1½-inch iron pipe with 2-inch posts set in cement around the East and West Central Parks and around the little park near the Bromide Spring. It was his desire to build ornamental conglomerate rock gateposts at the entrances to these parks. These little parks are near the limits of the city of Sulphur and are much frequented by visitors, and the old method of fencing with wire, especially for these portions of the park, is not in keeping with what might be expected in a national park.

Without fencing of some kind around these parks, it would be impossible to keep campers from stopping overnight in them or for a noonday meal, leaving them badly littered. I am adding my recommendation to the ones previously made by the former superintendent that this improvement be provided for in the next appropriation.

BUILDINGS.

About the only repairs made to the park buildings during the past year was the painting of roofs on the superintendent's residence and office and the cottage occupied by the laborer at the Bromide Spring. It has been impossible for some years past to make extensive repairs to these buildings because of the lack of funds with which to do the work. I find they are all in bad repair with exception of the ones newly constructed, and unless something is done toward restoring these old buildings at an early date they will become uninhabitable and the expense of repairing them will be probably more than they are worth. Some of these have not been repapered since the segregation of the park, and are leaking badly. Even the superintendent's residence needs some repairs which it will not be possible to have made during the present year because of the small appropriation made for improvements in the park. It seems to me a bad policy to pursue to allow the park buildings to stand until they are ready to fall down when they should be added attractions to the park. It is really necessary to have residences within the park for the employees, and I am making recommendation herein that an amount sufficient to properly repair them be made available in the next appropriation.

BENCHES.

The park benches were all repaired during the present season and repainted, and a number of stationary benches were built around the trees in West Central Park, the little Bromide Park, and near the Cold Spring. These were constructed of 1 by 12 lumber and built in a square around the trees. These benches were also painted.

In the Bromide Park, at the Cold Spring, and just west of the Pavilion Springs, long picnic tables with stationary benches along the sides were built for the accommodation of small picnic parties who desired to take their lunches at these places, and these were given one coat of paint.

ROADS.

If the park roads are not extensively repaired within the next two years it will become necessary to rebuild them at much greater cost than the repairs would amount to. These roads are constructed of a native cement gravel which disintegrates during dry weather if traveled over extensively. This makes it easily washed out by the rains which follow, necessitating almost constant patching and grading.

It is impossible to properly maintain these roads with the meager appropriations which have been given this park for some years, provided any other work is done, and for several years just passed there has been other work in the park which was even more imperative than repairing the roads. They have been in fairly good shape, but from now

on they will begin to deteriorate rapidly unless Congress makes an appropriation sufficient to permit of the proper repairs being made to them. I include in my estimate an amount for this purpose which will probably be sufficient for the time covered by the next appropriation.

ANTELOPE AND BUFFALO SPRINGS.

I am advised by the former superintendent that these springs ceased to flow in January of 1918, for the third time within his knowledge during a period of 27 years. The first time was in 1911, when both springs ceased to flow altogether and continued dry until the spring of 1913, at which time they resumed their flow at a very limited ratio of their normal capacity. They continued at this rate until the fall of the same year, when they again stopped. A few months later, however, they resumed activities and continued to flow at about half their regular rate until January of last year, when they again stopped running and have remained dry to this date.

Col. Sneed says that old settlers who were here prior to his knowledge of the place claim that these springs had failed once before, in about the year 1891, but nobody has ever advanced an opinion as to the cause for this that could be relied upon as being the real facts in the case. The problem before us now is to find some remedy for this state of affairs. These springs have always formed the source of the beautiful Travertine Creek, with its numbers of attractive waterfalls, and to have the creek dry (with exception of a short distance below Bear Falls, where it is supplied by springs in the bed of the creek) is really in the nature of a calamity to the park.

It seems that Inspector M. L. Dorr, of the Interior Department, was here in the early fall of 1913 and made recommendation that artesian wells be drilled at both the Antelope and Buffalo Springs, going down deep enough to reach a sufficient supply of water to insure a good stream in the bed of this creek. If it is possible to do this, I think it would be to the interest of the park to provide the way, and I am making recommendation hereinafter in accordance with that made by Mr. Dorr, and subsequently by Col. Sneed.

HOME-COMING PICNIC.

On the Fourth of July last the citizens of Sulphur gave a big home-coming picnic in the park to the returned soldiers of the World War. This was widely advertised, and thousands of people came here and spent two days of real pleasure in the park. The returned soldiers and sailors were everybody's guests for the days—the 4th and 5th.

ANIMALS, BIRDS, AND WILD FLOWERS.

In the spring of 1917 the city of Oklahoma, in this State, presented to the park three fawns out of a surplus which they had on hand, the deer being of the white-tailed variety. Since that time the herd has increased in number, and it is known that there are now seven of these deer. They are very friendly to visitors, will eat out of their hands, and like their noses rubbed, and are a source of pleasure and interest to the people who come here.

I have taken up with Mr. Frank Rush, of the Wichita Forest Reserve in this State, the question of obtaining three buffalo for the park, and he has expressed a willingness to let me have two females and one male, provided he can obtain the permission of the department to have the transfer made.

I also have in mind obtaining some elk from the Yellowstone National Park as an added attraction, and have already requested your department to arrange with the superintendent of the Yellowstone to furnish me with a male and two females.

There is ample feed stuff raised on the park to take care of these animals, and I am anxious to add every feature possible for the pleasure and entertainment of visitors.

The little brown squirrels which abound in this park are such friendly little animals that they eat out of the hands of visitors and even dart into their pockets and help themselves. The flocks of blue jays are also found where the visitors are feeding the squirrels, and are apparently as little afraid of the people as are the squirrels. Surely they are unafraid of the squirrel, and will often be found trying to pick a quarrel with the squirrel over the possession of a fine nut. They are quicker in action than the squirrels and often avail themselves of food meant for the squirrels, much to the amusement of the visitors.

The sweet-voiced mocking bird is found in this park the entire year, and during the breeding season (like the nightingale) is oftentimes heard singing in the park throughout the night. One resident student of bird lore a year or two ago advised this office that he had been able to identify 30 varieties, among them being the beautiful cardinal, the bluebird, the dainty wren, the humming bird, and several varieties of the finch, including the painted bunting which is rare in this section of the country.

A student of botany was able to determine the species of 52 varieties of wild flowers within the park, while there were countless others which were not classified. The quail within the park have multiplied with the protection afforded them by the rule against hunting in the park until they are now quite plentiful, and evidently feel their security to the extent that oftentimes covies of them will come up quite boldly on the office porch.

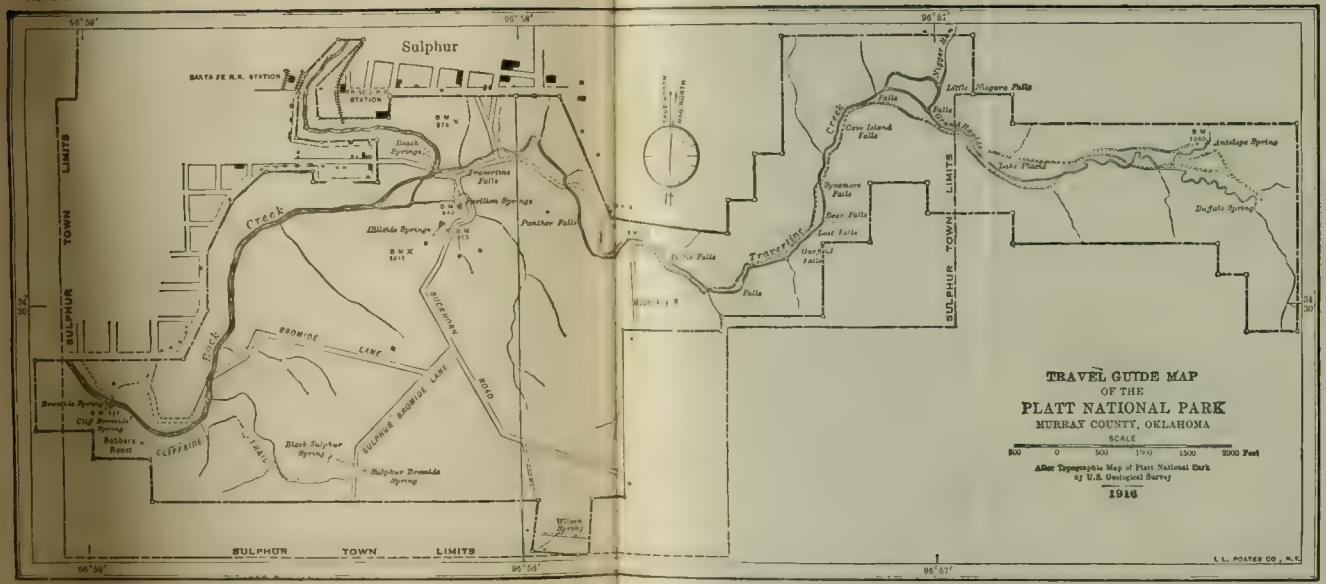
RECOMMENDATIONS.

I recommend that Congress be asked to appropriate the sum of $2,250 to build the walk with its necessary retaining walls along the cliff side from the Bromide Pavilion to the bridge, which has been covered into this report hereinbefore under paragraph "Bromide Bridge and approaches," and for the purpose of providing cement walks from the walk already laid to connect with the south approach of this bridge.

I recommend that provision be made for at least $1,000 for the repairs discussed under heading "Cliffside Trail" in this report.

For the iron fence around the parks near the city of Sulphur, which I described under the heading of "Fencing," the former superintendent estimates that it would require at least $3,700 for labor and material sufficient to build same.

I believe it will require at least $5,000 to properly renovate and repair the park buildings which need overhauling, including some of the pavilions, and with the prevailing high prices of labor and material I am not at all certain that even this amount would suffice, but at least I could make some progress toward keeping them from falling into decay. This line of improvements in the park has been fully discussed under "Buildings" herein.


Sulphur
SANTA FE R.R. STATION
M.K.&T. R.R. STATION
SULPHUR TOWN LIMITS
Beach Springs
Travertine Falls
Pavilion Springs
Panther Falls
Lillside Springs
Beach Creek
BROMIDE LANE
BICENTENNIAL ROAD
SULPHUR BROMIDE LANE
CLIFFSIDE TRAIL
Robbers Roost
Cliff Bromide Spring
Black Sulphur Spring
Sulphur Bromide Spring
Wilson Spring
Travertine Creek
Falls
Cave Island Falls
Little Niagara Falls
Lake Placid
Sycamore Falls
Bear Falls
Lost Falls
Garfield Falls
Antelope Spring
Buffalo Spring
TRAVEL GUIDE MAP
OF THE
PLATT NATIONAL PARK
MURRAY COUNTY, OKLAHOMA
SCALE
500 0 500 1000 1500 2000 Feet
After Topographic Map of Platt National Park by U.S. Geological Survey
1916
96°59'
96°58'
96°57'
34° 30'
C. L. POATES CO., N.Y.

I shall ask in this recommendation for but $1,500 for repairs to the park roads, and if even this sum should be allowed annually I believe it would be possible to keep them, as outlined under the heading of "Roads" above, in fairly good shape.

In former annual reports the superintendent who lately had charge of the park recommended the drilling of two artesian wells as delineated under topic headed "Antelope and Buffalo Springs," the wells to be sunk at locations of these springs. Col. Sneed emphasized the necessity for this in his special report to me when I assumed administration of the park, and placed his estimate of cost for this exploit at $2,500. I, therefore, recommend that this sum be requested of Congress for this purpose.

Col. Sneed advises that it has been his ambition for some years to get Congress to appropriate for a Government owned and operated bathhouse in the park, the estimated cost of the building, including equipment, not to exceed $25,000. He advises that the supply of water for the bathhouse could be obtained by gravitation from the Hillside Spring, while the sewage could be emptied into the manhole of the flush tank on the south bank of Travertine Creek, which is a part of the siphon to Line B of the park sewer system and a distance of about 300 feet from the proposed bathhouse location. It was his desire to have this bathhouse located north of Hillside Spring and northwest from the Pavilion Springs. I repeat his recommendation.

I should like to have appropriated at least $1,000 for trimming out trees in the park, cutting weeds, and clearing out underbrush.

For my general maintenance fund, I believe I should be furnished with at least $1,000 and $1,000 for repairs to fences; and I suggest that about $750 be provided for my contingent fund.

The former superintendent has several times recommended the improvement of the Beach Springs (three in number), which are located just north of Coney Island Ford, but to this date nothing has been done along this line. He advises that the waters of these springs are preferred to any others by many of the visitors to the park and that they should consequently be improved, protected from the overflow of the high waters of Rock Creek, and a pavilion erected over them. The proposed improvements at these springs, as carefully studied out and delineated by him, consist of confining the three springs under one large inverted funnel, so as to make a combined flow of the three springs from one outlet, the funnel to be constructed of galvanized iron topped by a cement covering, the approximate measurement of the inclosure to be 600 feet. Surrounding the inclosure to the springs proper should be built a square inclosure to prevent overflow of these springs by the creek, this second inclosure to be about 6 feet high at the creek edge and bedded back into the hill, the depth of the side walls gradually decreasing as the hill rises, but the top of the wall remaining level with the wall along the creek edge, the approximate measurement of this entire wall being 540 square feet.

On the bottom of the outer inclosure to be laid a cement floor, rising with the hill in a succession of 4-foot steps with 6-inch risers, the approximate surface of this floor measuring about 720 feet.

On the top of the outer inclosure to these springs it was Col. Sneed's plan to erect a pavilion supported by conglomerate rock columns, the size of the pavilion to measure 24 by 30 by 9 feet, finished with a pagoda roof with a small dog house on top. A flagpole or a large electric light could top the dog house. The total probable cost for this improvement would now amount to about $2,500, while Col. Sneed's first estimate for the entire job was $1,000.

Lastly, I should recommend the regular appropriation of $4,840 for administration.

SUMMARY.

Briefly, I have asked in my recommendation for an appropriation for this park of $52,040, and I am frank to say that I believe if the Congress of the United States intends to appropriate for the upkeep of this attractive little park it should do so in sufficient amount to make it an ornament to the National Park Service and a credit to the big nation which is backing it and not allow it to grow up into a wilderness and the improvements now within it to fall into decay by default.

The waters of this park are uncommonly beneficial in the cure of diseases, and the park has proven a restful outing place to tired, overworked people, and a haven to the sick and nervous. It is almost always cool in the summer, few mosquitoes are found here, and it is probably the only place in this section of the country where people of moderate means may come for rest and recreation.

In this report I have been guided principally by the information given me by the former superintendent, since I have not been here a sufficient length of time to fully inform myself as to the conditions existing in the park, but I hope that next year Congress will not fail to properly provide for this small member of the big "National Park Service" family.

MESA VERDE NATIONAL PARK.

THOMAS RICKNER, Superintendent, Mancos, Colo.

GENERAL STATEMENT.

The Mesa Verde National Park was established by the act of June 29, 1906 (34 Stat., 616). It is situated in the extreme southwestern portion of Colorado, in Montezuma County, and originally embraced an area of 66.2 square miles, or 42,376 acres, but by the act of Congress approved June 30, 1913, the boundaries of the park were so changed as to include an aggregate area of 76.51 square miles, or 48,966.4 acres.

Mesa Verde is a high table-land dividing the Mancos and Montezuma valleys. This mesa is elevated above the valleys some 2,000 feet, and rises abruptly from their floors, with precipitous sides like the walls of a canyon. The northern extremity of this great mesa terminates in Point Lookout, which juts out between the two valleys, a landmark for miles in all directions.

The surface of this mesa is broken by innumerable canyons, which start from the very edge of the mesa on the northern and western sides and, growing deeper and more rugged as they descend, finally open out into the Mancos Canyon. These canyons have many great caverns in their side walls, with overhanging rock for roofs, and in the caverns are found the ruins of the cliff dwellers.

CUSTODIANSHIP.

The custody of the park is delegated by the director of the National Park Service to a superintendent, whose office is maintained at Mancos, Colo., the nearest railroad point to the park. The superintendent is assisted by a limited number of rangers, whose duty it is to act as guides through the ruins and to police the park. The best of order has been maintained, and no violations of the rules and regulations have been reported.

TRAVEL.

The number visiting the park during the season of 1919 will be a little larger than that for 1918, and this number will be greatly increased when good roads from both the north and west have been made. When a number of short distances have been covered by automobile roads, Mesa Verde will be on one of the continental highways, and very few will pass over this road without calling for a few days at the Mesa Verde Park. More and more each year the tourist is coming in by automobile, and few horse-drawn vehicles make the trip. Two thousand two hundred and eighty-seven tourists registered during the season of 1919.

The number of private cars going into the park up to and including October 12 has been 436 and they have come from 20 different States.

CONCESSIONS.

Only one concession for a hotel in the park has been granted, and this has been found to be ample for the accommodation of all visitors.

Two concessions have been granted to transportation companies to carry passengers into the park. One concessioner, The Mesa Verde Transportation Co., handles all tourists coming by rail, as well as all local people, and the other, The Merrick-Timberline Tours Co., carries passengers only from Denver and Colorado Springs.

One grazing permit has been granted for the grazing of cattle on all lands remote from the ruins and roads. The cattle are kept in the park in the early spring and the late fall, leaving the park with only a few head of stock during the months of tourist travel.

SPRUCE TREE CAMP.

Spruce Tree Camp is located on the west side of Spruce Canyon, a branch of Navajo Canyon, and commands a fine view of Spruce Tree House, one of the most interesting ruins in the park. The camp is 32 miles from Mancos, and near the more important ruins. The camp consists of a hotel building in which are the dining and service rooms. A picturesque log building, on the verge of the canyon, contains the museum, which is fitted with massive cases for the curios, a large rest room with stone fireplace, and a broad piazza overlooking the canyon and the ruin, Spruce Tree House. Rows of well-furnished, floored tents, placed on terraces one above another, furnish the sleeping apartments. A large automobile shed gives shelter to the cars. The ranger station is a pretty cottage on rising ground above the camp, and a stone tower contains the water tank from which the camp is supplied with water. Spruce Spring, under the cliff in the canyon, furnishes a supply of fine water, and is pumped to the water tower above the camp. An electric-light plant located at the hotel furnishes the light and adds much to the comfort of the camp.

The museum contains many objects of interest, all of which have been collected from the ruins in the park. There are mummies, pottery of various kinds, implements, sandals, and a rare collection of beads. These last are the most wonderful specimens of the handiwork of these ancient people yet discovered. How they were shaped and perforated is one of the mysteries hard to solve. If labor represented in those days any value, these beads must have meant riches to the owner.

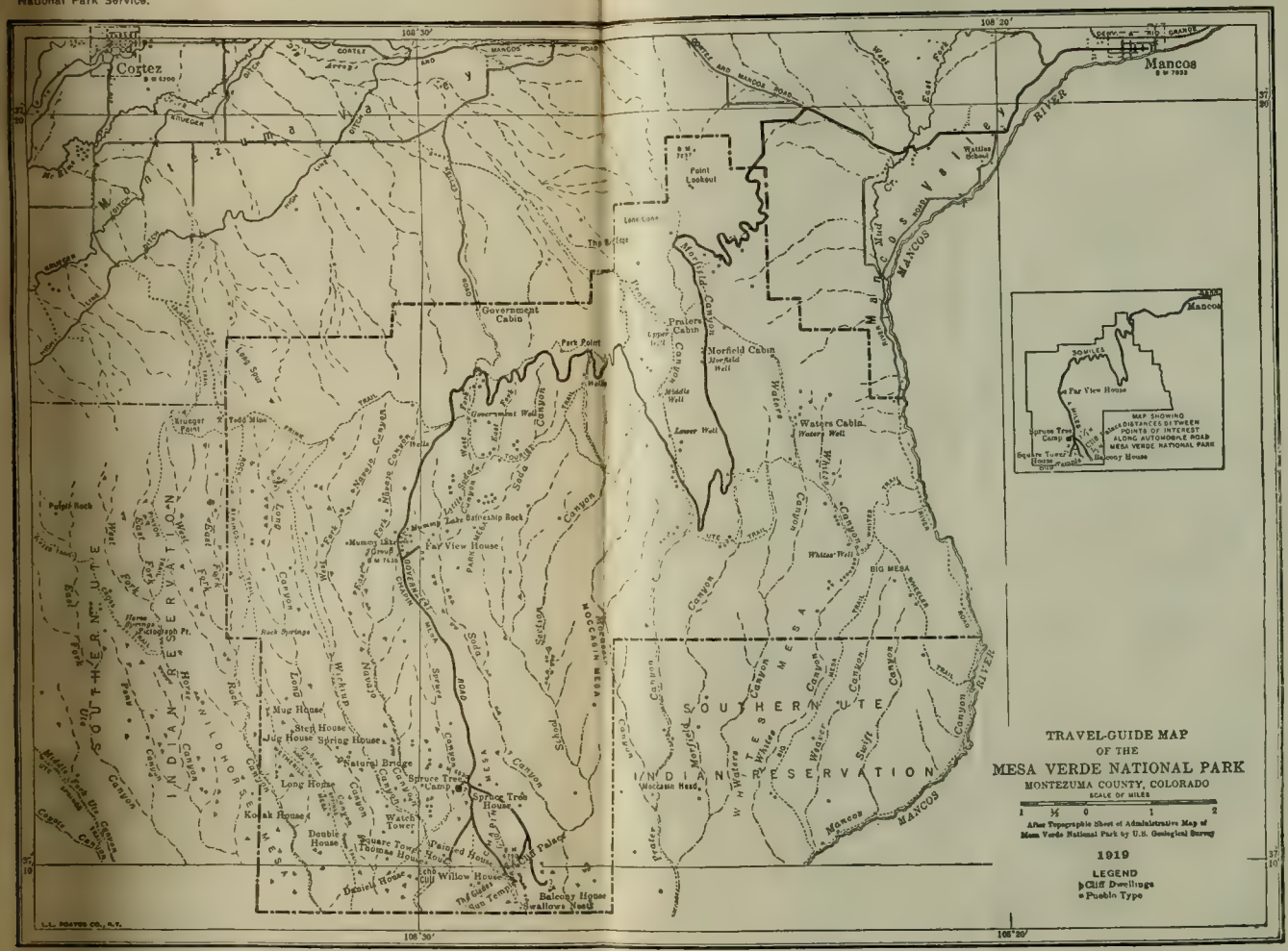
RUINS.

Among the best-known ruins and those easiest of access are Spruce Tree House, in Spruce Canyon, directly across from the camp; Cliff Palace, in Cliff Canyon, 2½ miles from camp; Balcony House, in Soda Canyon, ½ mile beyond Cliff Palace; Sun Temple, on the mesa between Cliff and Fewkes Canyons, 2½ miles from camp; Oaktree House and Painted House in Fewkes Canyon, under Sun Temple; Square Tower House, in Navajo Canyon, 3 miles from camp; and Far View House, on Chapin Mesa, only a few rods from the road that leads into the park, and near Mummy Lake, which is supposed to have been an artificial reservoir for the storage of water. Spring House and the natural bridge are reached by trail, about five miles from camp, in Long Canyon. Many tourists make the hike to this interesting point, and many more would go if it could be reached by automobile.

The Rock Spring section has a large number of interesting ruins of various types, some of them very extensive, and when this portion of the park is penetrated by a good road, it will be a valuable addition to the pleasure of a sojourn here.

Cliff Palace, Spruce Tree House, Balcony House, Painted House, Oaktree House, Sun Temple, and Far View House have all been restored, and all parts of them are accessible to the tourist. In the restoration of these buildings no attempt has been made to restore them to their original appearance by constructing the fallen parts. They have simply been cleaned of all fallen stone and rubbish and the unsafe walls strengthened. Nothing new or modern has been supplied and the buildings stand in their ruined condition, only so cleaned out that the visitor can walk about them and in his own mind reconstruct them as his fancy dictates.

Square Tower House, in Navajo Canyon, is now being restored by Dr. J. Walter Fewkes. This ruin has always been of interest to visitors from its individuality so different from other ruins in this section. It takes its name from a five-story tower, the lower story of which is covered by the fallen stone and the rubbish. The tower was fast falling into hopeless decay, but will be repaired where absolutely needed and held to the wall of the cliff by iron bands, making it perfectly safe and saving it from further destruction. In this ruin were found the only kivas with the original covers or roofs intact. Some destruction to these roofs was done in early days by pothunters, but they can be repaired and will show the work of the builders. In a niche in the wall, above and commanding the ruin, is a small fort with loopholes pointing downward, where two men could, with the primitive weapons of that time, hold out against any number.



TRAVEL-GUIDE MAP
OF THE
MESA VERDE NATIONAL PARK
MONTEZUMA COUNTY, COLORADO

SCALE OF MILES
1 ½ 0 1 2

After Topographic Sheet of Administrative Map of Mesa Verde National Park by U.S. Geological Survey

1919

LEGEND
▲ Cliff Dwellings
● Pueblo Type

L.L. POATES CO., N.Y.

These ancient buildings show the wonderful achievement of a race of people who lived so long ago that no man can accurately estimate the date of their occupancy. Each one must construct his own theory of this race, and he can judge of them only by the work of their hands which remain to us to-day after the lapse of ages. No records of their lives are left except these silent evidences of their skill and workmanship. What were their lives, their aims, and ambitions can only be guessed at, and this park, with its hundreds of ruins, presents a great field for conjecture. That they were a numerous people, their ruined homes scattered everywhere over this southwest testify. In ages past, when this country was populated by this bygone people, this section had far more dwellers than at present; but they are gone, leaving no record of their existence other than their works, which have so wonderfully withstood the ravages of time.

No one can visit this park and not feel the mystery and romance of it all. It appeals to the imaginative, and one visit to these old cities only stimulates a desire to see them again.

CROP GROWING.

Many people have doubted the assertion that the corn found in the ruins was raised on the mesa without irrigation. Many specimens of corn have been found in the ruins, and the question naturally arose as to where it came from. A demonstration has been made this year that shows conclusively that corn can be raised on the mesa, without irrigation. Two small areas have been planted to corn, and an abundant harvest of excellent quality demonstrates where the corn found in the ruins came from. A few potatoes were also planted as a test, and they are yielding good returns.

SCENERY.

The beautiful drive into Mesa Verde Park from Mancos is not the least of the pleasures one derives from a visit to the cliff dwellers' country. The scenery is varied and unsurpassed. Leaving the Mancos-Cortez highway, the traveler turns his back on all signs of the improvements of civilization. He steps at once into an unbroken wilderness where the road on which he is traveling is the only mark of man's handiwork. This road winds through a sagebrush country dotted with clumps of pinyon and juniper trees. After skirting the base of Point Lookout, the most northerly portion of the park, the road commences the ascent of the mesa, zigzagging along the hillside, always ascending, but nowhere at a heavier grade than 8 per cent, it reaches the top, passing through "The Saddle" and debouches into Morefield Canyon near its head. From this part of the road one sees the Mancos Valley spread beneath him, checkered by the fields of hay and grain, the town of Mancos showing like a collection of dots upon the floor of the valley. The La Plata Range of mountains looms high and rugged beyond, with Hesperus towering above all.

Through Morefield Canyon, across the divide and up Prater Canyon, the road comes back to the northern cliffs of Mesa Verde, and from this vantage point one can see the great Montezuma Valley, a vast plain of wild lands, spotted with cultivated areas. Beyond and guarding this big valley is Ute Peak—"The Sleeping Ute"—beautiful in its solitude, rising abruptly from the plain, with no foothills to dwarf its height.

In the distance, soft and hazy, almost blending with the sky, rise the Blue Mountains, in Utah. To the north are the Rico Mountains, snow tipped and rugged. Lone Dome lifts its head like some Egyptian pyramid. One can see from here the "Four Corners," the [illegible] in the United States where four States meet—Colorado, Utah, New Mexico, and Arizona. From here the road heads numerous canyons, many times coming back to the [illegible] dge, giving again and again a panoramic view of the Montezuma Valley and n ranges beyond.

he south the land stretches out until it seems to meet and melt into the sky. t sea of blue, Shiprock stands out and looks not unlike some monster brig ls set. Down the crest of Chapin Mesa the road leads through cedar growth, amy Lake and Far View House, the wonderful old ruin excavated by Dr. J. Walter the summer of 1916, and finally, after making a turn, one sees the Stars and ating over the heavy growth of trees, and knows that Spruce Tree Camp is he many deep canyons, with their cunningly built homes and towns in the their walls, all add to the picturesqueness of scenery as beautiful as it is he views from some of the ruins are superb, as the canyons in which the larger ocated are deep and precipitous.

ROADS.

ds in the park have been kept in good condition, though frequent and heavy made repair work almost constant during the season.

road which ascends the mesa on the eastern side has been completed and in ing the summer. No big landslides have occurred on the old road, and that also has been kept open to travel, most of the cars going into the park one way and returning by the other. This choice of roads, giving a different route each way, has given great satisfaction to tourists. Ascending the mesa by the old road gives a grand view of the country to the west and north, and the descent by the new road shows the Mancos Valley and the La Plata Mountains to great advantage. No vehicles are allowed to meet on the old road, and a system of telephones protects the traveler from such encounter. Vehicles can meet and pass on the new road at any point, and the road can be seen ahead for long distances. From one point just below "The Saddle" the road can be seen at 12 different levels as it zigzags down the mountain side.

All the roads from Spruce Tree Camp to the different ruins have been kept in good condition by grading and dragging as the rains washed them.

TRAILS.

No new trails have been made during the year, but the old ones have all been worked by the rangers. New ladders to replace old and unsafe ones have been made and placed. The trail to Square Tower House, which passes over a sloping ledge that overhangs the canyon, has been blasted out and a strong iron railing been placed along the outer edge to protect the tourist and open this interesting ruin to all. Heretofore, one desiring to visit this ruin could only do so by holding to a strong rope anchored above, while passing across this dangerous place.

WILD ANIMALS.

The black-tail deer, in small bands, make their home in the park, and several herds of from 10 to 16 have been seen, besides a number of single animals. These deer would rapidly increase if it were not for the depredations of the predatory animals. Coyotes, in large numbers, infest the park, and the cliffs along the northern boundary give sanctuary to mountain lions. These latter animals are the worst enemy of the deer and take annually a heavy toll. They should be systematically hunted out, and the only way to do this successfully is to secure the services of experienced hunters with trained lion dogs. After the young are old enough to travel about, they leave their haunts among the cliffs and lead a wandering life, one day in one place and, perhaps, many miles from there on the next. They are occasionally seen in different parts of the park, and Mr. C. R. Beers, the transportation concessioner, one day in July, while driving a car down Morefield Canyon, saw a young lion cub lying in the road. Seemingly with no fear the cub allowed the car to approach, and Mr. Beers, who was alone in the car, thought he had an easy captive. Stopping the car, he was about to step out and secure the prize, when a fierce spat in the bushes at the side of the road drew his attention, and there was the mother lion, crouched ready for a spring, and with her two more cubs. The fine dental display of the mother lion caused Mr. Beers to change his plans and he started his car, leaving the mother and her young unmolested.

Bobcats are often seen in the timbered portions of the park, and coyotes are no rare sight to tourists along the road. There are many foxes and other small animals. During the last winter a ranger, aided by one man trapped five coyotes, two bobcats, and thirteen foxes.

WILD FLOWERS.

Many varieties of wild flowers are found in the park, and in the early summer outside the timbered portions the park is a blaze of color. During the present season, on account of an unusual fall of rain, the northern portion of the park and the canyon floors have been a beautiful sight. One could see for miles a carpet of the richest colors, not in patches or clumps, but one great spread of color.

RECOMMENDATIONS.

A great many suggestions for the improvement of the park could be proposed, but as it will take years of well-directed labor and great expense to bring all the beauties and wonders of antiquity to a condition where they can be enjoyed only the most pressing needs will at present be considered.

Extension of the present road system and restoration of more of the ruins are among the most needed improvements. A road from Spruce Tree Camp to the southern boundary of the park to connect with the Cortez-Shiprock road, shortening the distance from the camp to Shiprock by about 76 miles, would be of great benefit to tourists who visit the park in automobiles. Most of the visitors to the park go from here to Shiprock and to do so have to return to the Mancos-Cortez highway, thence to Cortez, and on to Shiprock, a long distance, while the proposed road would be direct. For visitors from the west it would be of the same benefit.

A road from the present road in the park at a point near the head of Navajo Canyon, along the northern edge of Mesa Verde to Wetherill Mesa, down this mesa to Rock Springs and the many ruins in that vicinity, would open up a great deal more of the park to visitors. The ruins in the Rock Springs country are very interesting, some of them very large. This road would make it possible for tourists to visit and explore all the finest ruins in the park, many of which are now beyond the reach of any but the hardiest travelers. Another road that should be constructed at an early date is a short piece of road from Station 64, at the head of Morefield Canyon, to the summit of Point Lookout. The distance would be little more than a mile, and the view obtained from the point would compensate for many times the distance. It would be a side trip that would be taken by all, for the view embraces the mountain region in every direction.

The restoration of Mummy Lake is something that should be undertaken soon. Cleaned out and made water-tight this little lake could be kept full of water most of the season.

This park is so well adapted to the grazing of animals that it should be the home of the many species of large game of America. Bison, elk, deer, and Rocky Mountain sheep could all be kept here, and there is winter grazing as well as summer feed for them. If the private lands within the boundaries of the park were acquired by the Service and the necessary fencing done, this could be one of the finest game preserves in the country. It could be so fenced that the tourist would travel through the game country, and this feature would be an added interest in the park.

GLACIER NATIONAL PARK.

W. W. PAYNE, Superintendent, Belton, Mont.

GENERAL STATEMENT.

The very successful tourist season just brought to a close marks the eighth year of the existence of Glacier National Park. This park was created by the act of Congress approved May 11, 1910 (36 Stat., 354), which set aside approximately 981,681 acres in northwestern Montana as a national playground. It includes that part of the main range of the Rocky Mountains lying just south of the Canadian boundary line and is bounded on the west by the North Fork of the Flathead River, on the south by the middle fork of that river and the tracks of the Great Northern Railroad, and on the east by the Blackfeet Indian Reservation. The scenic features of the park are alpine in character, the chief sources of interest being its innumerable lakes, rugged mountain peaks, and, as its name implies, numbers of glaciers of varying sizes. There are over 60 glaciers within the confines of the park, the most noted of which are within easy access of tourists, while many others are accessible if one is willing to undergo the exertions of mountain climbing.

Running through the center of the park in a northwesterly-southeasterly direction the Lewis Range of the Rocky Mountains practically divides it into two parts, referred to as the East Side and the West Side of the park. Each of these sides is in turn divided

into many valleys, through which flow streams fed by the glaciers lying on the sides of the mountains, each valley holding some peculiar attraction of its own. The most important of these valleys are the Two Medicine, Cut Bank, Red Eagle, St. Mary, Swiftcurrent, Kennedy Creek, and Belly River Valleys on the east side, the Little Kootnai Creek Valley on the north, and the McDonald, Logging, Quartz, Bowman, and Kintla Valleys on the west side of the park. Besides these, there are a number of small valleys on the south boundary of the park, although not comparing in interest to those named. The elevations in the park range from 3,100 feet to over 10,400 feet. The mountains are made up of layer upon layer of magnificently colored strata brought to view by the Lewis overthrust. The scientist will never tire of studying the geological formations of this interesting region.

The park is administered by a permanent ranger force of 14 rangers under a superintendent, chief ranger, and assistant chief ranger. Headquarters are maintained at Belton, Mont., the western entrance to the park, where an office force of three permanent clerks assists in this part of the administration. A limited phone service is maintained on the west side of the park, and on the east side the Glacier Park Hotel Co. maintains a line as far as Many Glacier during the summer months, although it is usually in bad repair after the close of the tourist season.

TRAVEL.

From the first the tourist season has been the largest this park has experienced, with increases far beyond the number entering during any previous years. During the period from June 15 to September 15, the close of the season, 18,956 visitors were registered, and it is probable that a considerable number entered the park at points other than the regular registration stations. This is approximately 5,000 more tourists than the highest previous record established in 1917.

The most striking increase in travel figures, however, is that showing the entrants by private automobile. The roads were generally in good condition throughout this part of the country, this fact helping to bring out tourists to the park in larger numbers than heretofore. The exceptionally light winter of 1918–19 kept the roads in excellent condition for early travel, and even though hot weather developed later on in the summer, making some of them very dusty, this fact did not lessen automobile travel.

The entrance fee for automobiles entering on both sides of the park was changed from the rate in effect during previous years, to be effective as follows: Automobiles or motor cycles, east side road system, $2.50 and $1, respectively; automobiles, west side road system, 50 cents; motor cycles free.

The main gauge of Glacier's popularity with all classes of the touring public is the ever-increasing number of people entering the park for the second or third consecutive season, especially when these "repeat tourists" come from far sections of the country.

The following statistics are given showing tourist travel by the various entrances and methods of travel during the past season:

Registration at Belton entrance:		
Via Glacier Park Transportation Co	2,259	
Via Park Saddle Horse Co	12	
Via private conveyances, auto	3,382	
Via private conveyances, horse-drawn	7	
Via private saddle horse	2	
Via mail stages	694	
Entered on foot	111	
		6,467
St. Mary entrance:		
Via Glacier Park Transportation Co	4,389	
Via Park Saddle Horse Co	195	
Via private conveyances, auto	2,528	
Entered on foot	20	
		7,132
Two Medicine entrance:		
Via Glacier Park Transportation Co	1,084	
Via private conveyances, auto	561	
		1,645
Many Glacier entrance:		
Via private conveyances, auto	412	412
Belly River entrance:		
Via Park Saddle Horse Co	254	
Via private saddle horse	134	
		388
Waterton Park entrance:		
Via boat from Waterton Lakes Park, Canada	1,842	
Via private conveyances, auto	31	
Via private conveyances, horse-drawn	12	
Entered on foot	9	
		1,894
Cut Bank entrance:		
Via Glacier Park Transportation Co	36	
Via private conveyances, auto	146	
		182
Kennedy Creek entrance:		
Via Park Saddle Horse Co	81	81
Mount Henry Trail:		
Via Park Saddle Horse Co	655	
Entered on foot	100	
		755
Total visitors entering park		18,956

Step-overs at Glacier Park Hotel not making automobile or saddle-horse trips therefrom, 3,158.

Automobile permits issued:		
Belton entrance	770	
St. Mary entrance	671	
Two Medicine entrance	140	
Many Glacier entrance	105	
		1,686
Complimentary		11
Total		1,697

Many persons prominent both in public and scientific circles visited Glacier during the past season besides many special parties. Mr. Leroy Jeffers, librarian of the American Alpine Club and secretary of the Associated Mountaineering Clubs of North America, visited the park during August accompanied by Mrs. Jeffers.

Mr. Theo. Noyes, editor of the Evening Star, Washington, D. C., was a park visitor during August, as was Prof. Walter A. Stanford, of the University of California.

On July 9 a party of the Massachusetts Forestry Association, consisting of about 150 persons under the guidance of Mr. Clinton L. Babcock, visited the park, entering at Glacier Park and Many Glacier and leaving by way of Lake McDonald.

A party of 25 tourists, conducted by a representative of the American Express Co., toured the park during July.

The Brooklyn Eagle party paid a visit to Glacier Park in the course of its tour through the Western States.

Another visitor of note was Mr. John Kendrick Bangs.

Travel entering the park from the various States and foreign countries through the main entrances, Belton and St. Mary, is shown by the following table:

Travel by States in Glacier National Park during the 1919 season.

	Belton entrance.	St. Mary entrance.		Belton entrance.	St. Mary entrance.
STATE.			STATE—continued.		
Alabama	1	8	North Dakota	82	130
Arizona	2	4	Ohio	67	170
Arkansas	6	5	Oklahoma	31	44
California	167	288	Oregon	61	90
Colorado	25	57	Pennsylvania	78	285
Connecticut	25	79	Rhode Island	1	5
Delaware	1	26	South Dakota	44	24
District of Columbia	33	82	Tennessee	4	27
Florida	7	17	Texas	19	44
Georgia	5	23	Utah	14	23
Idaho	56	37	Vermont	3	2
Illinois	282	624	Virginia	5	.....
Indiana	42	56	Washington	317	202
Iowa	104	148	West Virginia	2	25
Kansas	51	70	Wisconsin	89	142
Kentucky	5	27	Wyoming	11	29
Louisiana	17	30	Alaska	3	.....
Maine	2	15	Unclassified	49	.....
Maryland	4	23		6,392	6,900
Massachusetts	106	238			
Michigan	46	108	COUNTRIES.		
Minnesota	278	563			
Missouri	125	185	Canada	66	220
Mississippi	4	8	China	1	.....
Montana	3,904	2,185	Hawaii	2	12
Nebraska	71	89	Norway	1	.....
Nevada	1	.....	Porto Rico	5	.....
New Hampshire	.....	3		75	232
New Jersey	37	125			
New Mexico	4	5			
New York	147	510	Total visitors	6,467	7,132
North Carolina	3	20			

ACCIDENTS.

On July 17, Mrs. E. L. Rogers, of Bridgeport, Conn., was thrown from a horse into a snow bank near Summit Pass, suffering from shock and numerous bruises. Settlement was made with the injured party by the Park Saddle Horse Co., in amount of $58.

I regret to report the death of Mr. J. O. Kettlesand, who died suddenly of heart failure while in camp at the south end of St. Marys Lake on September 1, 1919. Mr. Kettlesand was a resident of Ethridge, Mont.

CONCESSIONS.

All hotels and chalets within the park with the exception of Sperry and Granite Park chalets were open by June 15—the two named not being open to tourists until about the 25th of June.

If travel to Glacier Park increases in the next few years at the rate at which it increased this past season, more adequate accommodations must be provided both in the way of hotel and transportation facilities. On several occasions the sudden influx of large numbers of tourists was more than the present facilities of some of the camps was prepared to care for. The saddle and pack horse concessioner also experienced difficulty

in meeting the needs of those desiring horses for short trips on some occasions. This has been caused mostly by the large number of camping parties in the park. In my estimation, however, this company deserves credit rather than criticism for the efficient way in which it has handled the situation this summer, considering the tax that has been made upon its facilities.

Owing to the friction caused during the 1918 season, it was not deemed wise to renew the boat-transportation permit issued in that year to George E. Snyder. The regular concessioner, Frank Kelly, has rendered good service under his boat permit in the past and during the 1919 season has been able to care for the travel on Lake McDonald to the satisfaction of all.

Mr. H. H. Hanson operated his launch and tourist supply store on Waterton Lake during the season under a renewal of the permit issued him last year.

REVENUES.

Gross revenues collected and transmitted to the Service during the fiscal year ending June 30, 1919, are tabulated as follows:

Sale of automobile permits	$1,248.50
Transportation concessions	235.00
Telephone rental	164.00
Grazing privileges	555.00
Sale of hay	171.24
Sale of predatory-animal furs	627.43
Residence permits	150.00
Timber sales	37.76
Pasture privilege	5.00
Great Northern Railroad Y track permit	9.18
Total	$3,203.11

WEATHER.

For the most part the summer of 1919 has been exceptionally hot and dry, hot northerly winds prevailing. The average maximum temperature from June 15 to September 15 was 83.5°, the total precipitation during that time being only 3.094 inches. During this period there were 88 clear 23 partly cloudy, and 11 cloudy days recorded at the cooperative observation station at park headquarters.

This hot, dry condition was the cause of numerous forest fires both in the park and in the forest reserves adjacent thereto, and the smoke from these fires at times made it impossible to see any distance. Some of the roads also threatened to get into bad condition owing to the winds carrying the dust thrown up by automobiles.

ROADS.

All of the roads in the park have been kept in very good condition considering the unfavorable weather experienced during the past summer. As previously mentioned, hot winds have kept the dust blown up in many places, and the constant heavy motor traffic has pulverized the fine material and the wind has blown it away, developing potholes which were impossible to improve on account of the lack of rain to bind the materials in place.

Owing to the fires that started early in the season, very little improvement work was accomplished on the roads after the season started, as it was necessary to withdraw all road and trail crews for fire fighting on account of the scarcity of labor.

Glacier Park–Many Glacier Highway.—The work on this road during the early spring consisted of cleaning gutters, filling holes, grading and repairing drainage structures, planking the old pole bridges, and some graveling.

Between 14 and 17 mile posts, the road has been scarified, graded, widened to from 16 to 18 feet, and graveled, and now only needs moisture and rolling to complete it. Between 32 and 33 mile posts, some grading and graveling has been done to improve the bad stretch from St. Mary north to Divide Creek.

It is my hope, weather permitting, to grade, widen, and gravel about 2 miles of road from about Two Medicine Bridge south to Glacier Park. This is now a bad stretch of road during wet weather.

Two Medicine Road.—Work done on this road consisted of removing slides, cleaning gutters, repairing drainage structures, filling holes, and covering corduroys.

Cut Bank Road.—Slides were removed, gutters cleaned, drainage structures repaired, and some grading done on this road.

Belton-Fish Creek Road.—The work on this road consisted of graveling, cleaning ditches, and removing slides over a stretch of about one-quarter of a mile from the entrance to headquarters and filling holes from headquarters to Lake McDonald. The bridge across the middle fork of the Flathead River was also strengthened and repaired.

North Fork Road.—Work on this road consisted of removing slides, cleaning gutters, repairing bridges and drainage structures, removing stumps and large rocks, and some grading and widening.

Remarks.—It is my desire, if weather permits, to continue work on all roads and with the right amount of moisture get them rolled into proper shape before winter prevents further work.

It is also my desire to proceed with the timber cutting through the Divide Creek country that was started some years ago. It has been demonstrated that where the timber has been cut the road is almost bare early in the spring and has a chance to dry out thoroughly before traffic starts. When the timber still remains close to the road, enormous drifts have to be removed to open the road, and even though this is done it leaves the road moist and soft and easily rutted by heavy traffic.

Increased interest is being shown by motorists in the road under construction on the south side of the park from Glacier Park Station, on the east, to Belton, the western entrance. With the completion of this road will arise the necessity of a great deal of improvement work on the road system within the park on the west side.

The proposed road from the foot of Lake McDonald to Lewis's Hotel is already a necessity, and it is hoped that this project will be put through at once. The North Fork Road should also be improved so that cars can visit the numerous lakes and valleys in the North Fork country.

TRAILS.

All trails were open for the tourist season and all the well-traveled trails were in excellent condition. The Swiftcurrent Trail was cleared of all loose rocks and slides, and the retaining walls rebuilt. Slides and rocks were removed from Logan Pass Trail. About 1 mile of slide was removed from the Piegan Pass Trail. A walking trail was completed around McDermott and Josephine Lakes and foot bridges constructed at the stream crossings.

A trail is in the course of construction from Many Glacier east along Appekunny Mountain, thence up Kennedy Creek and over the Pass south and west of Seward Mountain to the foot of Elizabeth Lake.

It is also my hope that the magnificent Glenns Lake country may be opened up by the construction of trails during the 1920 season, so that a new triangle trip may be opened up out of Many Glacier, taking in Elizabeth and Glenns Lakes, going over Indian Pass to Waterton, and returning by Waterton Lakes Trail via Granite Park and Swiftcurrent Pass.

A short cut on this trail could also be opened up from Elizabeth Lake over Ahern Pass to Granite Park. Should this project be completed, it would no doubt prove one of the most popular trips in the park. The first side of this proposed triangle is being mapped out this fall—namely, the trail from Many Glacier to Elizabeth Lake.

Clearing was continued and some grading was done on the East Side Lake McDonald Trail. The usual maintenance and repair work was done on all other trails.

Foot trails are also under construction to the top of Altyn and Brown Mountains. These will afford excellent views of the surrounding peaks and give the tourists who do not desire long trips a chance to see the surrounding country.

BUILDINGS.

Owing to the loss of the Two Medicine and Kishenehn ranger cabins it will be necessary to reconstruct them this fall. Work has been started on the Two Medicine Station, and I hope to complete both before the close of the season.

A small building for the storage of oil, paints, and grease was erected at headquarters, and an additional equipment shelter will probably be built at headquarters during the coming fall.

FISH.

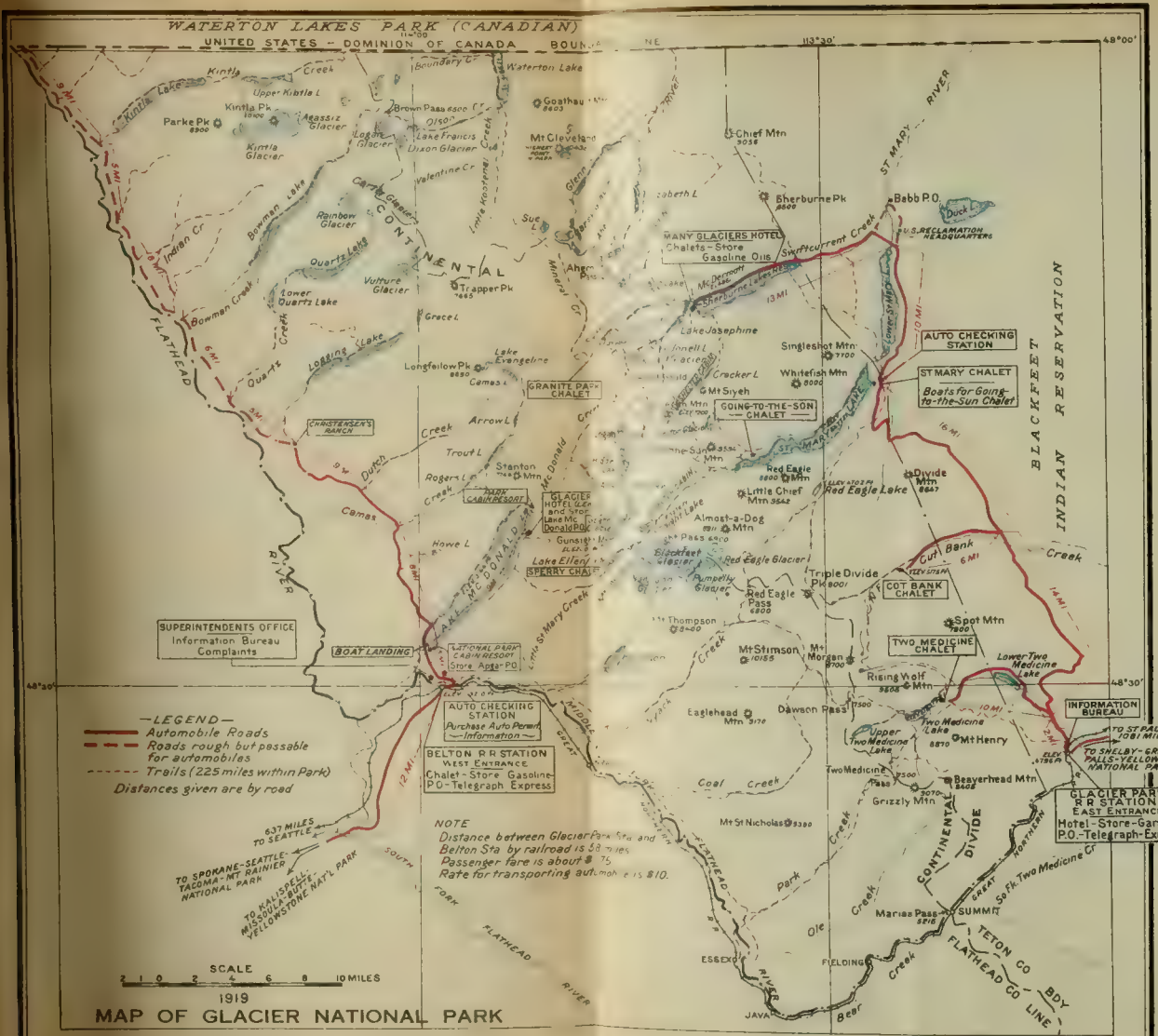
The fish hatchery at Glacier Park Station was put in operation during the fore part of June, and during the course of the season 921,000 young trout and 225,000 Montana grayling (*Thymallus tricolor montanus*) were planted in various waters on both the east and west sides of the park. Of trout planted, 350,000 were eastern brook trout (*Salvelinus fontinalis*), 387,000 were rainbow (*Salmo irideus*), and 184,000 Blackspotted, also known as the Cutthroat trout or native Rocky Mountain trout. The distribution of these fish, on the whole, was accomplished in a prompt and satisfactory manner.

The operation of this hatchery has proved very successful during the past two seasons, and will prove to be an important factor in making this park noted for its excellent fishing. We have been fortunate in having a very competent man in charge of the hatchery in the person of Mr. T. G. Langguth and a very sturdy and healthful lot of trout fry were planted.

Good fishing has been reported throughout the past season on both sides of the park. However, as a result of the large forest fires this sport has not been enjoyed by as many as would have, had not some of the lakes been inaccessible.

Plantings of fry from the Glacier Park Hatchery during the past season are listed as follows:

Date.	Number.	Kind.	Name of water stocked.
June 2	50,000	Eastern brook trout	Appistoki Creek.
2	50,000	do	North Fork of Cut Bank River.
2	125,000	do	McDermott Lake.
16	90,000	do	Coulons Bay, Lake McDonald.
16	10,000	do	Kellys Bay, Lake McDonald.
25	25,000	do	Appistoki Creek.
July 2	60,000	Rainbow trout	Headquarters of Swiftcurrent River.
3	60,000	do	McDonald Creek.
8	60,000	do	Lewis Bay, Lake McDonald.
15	18,000	do	Lower Two Medicine Lake.
15	90,000	Montana grayling	Two Medicine Lake.
15	135,000	do	Do.
17	36,000	Rainbow trout	North Fork of the Cut Bank River.
17	18,000	do	Triple Divide Lake.
17	6,000	do	Lower Triple Divide Lake.
18	25,000	do	Fish Creek.
18	25,000	do	McDonald Creek.
26	36,000	do	St. Mary Lake
28	6,000	do	Hyde Creek.
28	6,000	do	South Fork, Two Medicine River.
Aug. 7	20,000	do	Two Medicine Lake.
11	11,000	do	Midvale Creek.
15	30,000	Black-spotted trout	North Fork of Cut Bank River.
22	40,000	do	McDermott Lake.
25	40,000	do	Red Eagle Creek.
29	20,000	do	Lake McDonald.
31	40,000	do	McDermott Lake.
Sept. 2	6,000	do	Halloway Lake.
4	8,000	do	Midvale Creek.



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WILD ANIMALS.

As a result of a very light winter, all game is in excellent condition. This refers especially to the deer and sheep, of which large numbers have been seen during the past summer. On a recent trip into the Belly River country, the writer personally saw one band of Rocky Mountain sheep that probably numbered in the neighborhood of 250.

In addition to the game named, moose are found in considerable numbers around the lakes of the Flathead Valley and elk on the southern boundaries of the park in the vicinity of Nyack, Coal, and Park Creeks, also in the Two Medicine Basin. Some bear were seen by tourists in the trails, although they are not as numerous as would be expected in this region.

Predatory animals.—Since writing my last annual report, two hunters have been engaged hunting and trapping predatory animals in the North Fork Valley under cooperative arrangement with the Biological Survey. Owing to shortage of funds in the park appropriation, these hunters were taken off during the past spring. However, during the time that they were operating, a total of 79 predatory animals were taken.

The hides of 73 of these were sold at auction through Funsten Bros., of St. Louis, netting the park $627.43 for the lot. The last six pelts taken were turned into the Biological Survey by the hunters.

FOREST FIRES.

The fighting of forest fires has taken up the greater portion of the energies of the working force, as well as the funds available for improvement work during the past summer. The exceptionally dry climatic conditions resulted in the largest fires that the northwest has ever experienced, of which Glacier National Park received its share. We have been greatly handicapped in fighting fires by the scarcity of labor, and had it not been for the hearty cooperation on the part of the officials of the neighboring forest reserves it is probable that a great deal more damage would have resulted.

The following fires have occurred during the past summer:

On June 20 a fire was reported to the ranger in the Paola district as burning 1 mile west of Garry on the southern boundary of the park. This fire was extinguished in about two hours' time by the park ranger with the assistance of three section crews. No material damage resulted.

On June 21 a fire was reported burning 3 miles north of the North Fork ranger station. This fire was found to be burning over an area that had been burned over during 1917. The assistant chief park ranger secured a small crew and proceeded by way of Columbia Falls by automobile, having the fire practically out by June 28, after it had burned over an area of approximately 30 acres.

On June 22 a fire was found to be burning on Logging Ridge. With the assistance of a crew of three men this fire was put out before it had burned over more than approximately 20 acres of merchantable timber. This fire was probably started by lightning.

Adair Ridge fire.—This fire was probably started by lightning, being reported on July 7 as burning in section 15, township 34 north, range 20 west. High winds prevailed at the time, and the fire soon developed into a crown fire and was carried across a large area. All available men were transferred immediately to this fire and men shipped from Whitefish, Columbia Falls, Kalispell, and Great Falls.

A total of approximately 26,000 acres in townships 34 and 35 north, ranges 19 and 20 west, have been burned over by this fire. Most of the timber consisted of spruce, tamarack, fir, and lodge-pole. A good portion of the area burned over by this fire was burned over by the fire of 1910. A maximum of about 20 miles of control line was established, the number of men engaged ranging from 18 to 80.

Scalplock Mountain fire.—On July 6 a fire was discovered burning on the south side of the river opposite Scalplock Mountain near Essex. On July 9 this fire jumped the river and started burning on the slopes of Scalplock Mountain. The ranger in that district was immediately furnished men and supplies from headquarters and the fire was put under control by July 12. Approximately 30 acres were burned over, although little damage was done from a commercial standpoint.

Skyland fire.—On July 22 a small fire was started about a quarter of a mile east of Skyland on the southern boundary of the park, probably caused by sparks from a Great Northern locomotive. About a quarter of an acre of grass and small timber was burned over, resulting in no particular damage. This fire was put out by the park ranger, with the assistance of eight men recruited from section crews working on the railroad.

Trout Lake fire.—This fire was started by lightning on August 10 in section 29, township 34 north, range 18 west. A crew engaged in trail repair work in the vicinity of Lake McDonald was immediately transferred to the fire, and by September 1 it was entirely under control. A small crew was retained on this fire for patrol, although at the present time it is entirely out.

Walton Creek fire.—On August 18 Park Ranger Rohel reported a fire burning in section 23, township 32 north, range 18 west. High winds carried this fire in a northeasterly direction toward Harrison Lake, and before the fire could be brought under control had burned over approximately 5,200 acres. Only 1,000 acres of this, however, is green timber, the balance having been burned over in 1910 and 1917.

Bowman Lake fire.—This fire was reported on August 19, and three men immediately were put to work trenching around it and soon had it under control. It is located in section 5, township 35 north, range 20 west. The area burned over was approximately 1½ acres.

Ford Creek fire.—This fire started from sparks being blown onto the park from the forest reserve just across the North Fork River. It first started in section 19, township 36 north, range 21 west. Southwest winds blew the fire toward Park Ridge, and before it could be brought under control approximately 2,900 acres were burned over.

Two Medicine fire.—This fire started July 21 in section 21, township 32 north, range 14 west, having been started by carelessness on the part of some member of the Howard Eaton party. As a result of high winds the fire immediately developed into a crown fire and was swept down Dry Fork Creek toward the Indian Reservation. All of the crews working on the Blackfeet Highway that were available were transferred immediately to

the fire in the hope of bringing it under control before the beautiful scenery in the vicinity of Two Medicine Lake and Trick Falls was destroyed.

After about 10 days this fire was brought completely under control and was considered extinguished enough to be safe, so far as the park was concerned, and the crews returned to their regular work, with the exception of patrol crews. However, on August 19, the fire broke out in section 9, the exact cause of which is unknown. This fire immediately ran into a top fire and fanned by high west winds swept the south slope of lower Two Medicine.

The total area burned over by the Two Medicine fire was approximately 9,000 acres, of which only about 3,000 acres are in the park. There are, however, many places within this burned area that have not been touched by the fire, thus reducing the net amount of land burned over.

Kennedy Creek fire.—On July 29 a fire broke out on the South Fork of Kennedy Creek, in section 13, township 36 north, range 15 west, on the Blackfeet Indian Reservation, resulting from embers of a fire left by campers. The fire burned mostly in grass and scrubby timber and was put out by a small crew sent from Many Glacier before it could enter the park.

On August 10 a second fire broke out in the Kennedy Creek district, probably started from fires left by campers on the reservation. High winds soon blew this fire onto the park, and it was not until August 26 that sufficient assistance could be obtained from the Indian or Reclamation officials to put this fire out. Approximately 40 acres were burned over in the park and about 1,800 on the Indian reservation. The land in the park which was burned over was covered mostly by lodge-pole, undergrowth, and grass.

Red Eagle fire.—This fire was found burning at 6.30 p. m. on August 26 on the Red Eagle Trail near the river. Due to lack of high winds, this fire was kept on the ground and by the following morning was entirely under control. It was only as a result of prompt action that this fire was saved from developing into what would probably have been the most disastrous fire in the park.

Java fire.—On August 29 high winds caused the fire burning on the Forest Reserve south of the park near Java to jump Bear Creek and the Great Northern tracks and start a fire in the park near snowshed No. 10. Before this fire could be brought under control it had burned over an area approximately 6 miles long by ½ mile wide. The ground burned over was very rocky, and but little damage resulted from either a scenic or commercial standpoint.

In addition to the fires named, numerous small fires have been discovered along the railroad track on the south boundary of the park and put out by park rangers or fire guards with the assistance of section crews. Although most of these fires were started by sparks from Great Northern locomotives, the railroad officials have cooperated to the greatest extent in keeping the loss from these fires to a negligible amount.

In addition to necessitating the abandonment of all of the maintenance work throughout the park, the forest fires during the past season have cost approximately $46,000. Compared to the size of the fires and to the losses sustained by the National Forests in the northwest, Glacier Park may be considered fortunate in escaping with this cost.

Extreme caution was exercised from the earliest part of the season, as it was foreseen that we were going to experience a very dry spell and that too much care could not be exercised in preventing fires. Numerous fire guards were engaged in patrolling the entire south and west boundaries of the park, as well as the wooded parts of the east side.

RECOMMENDATIONS.

In my estimation, one of the greatest needs of this park is a central information and routing bureau located at the entrance at Glacier Park and operated by the Service to care for all auto and horse transportation in the park as well as chalet and hotel accomodations for tourists entering the park. This is the only way in which all interests will be served and the tourist assured of maximum service. The present method of allowing the tourist to have his trip planned by representatives of each of the various concessioners is proving more unsatisfactory each year. This need has been mentioned by various visitors to the park.

The construction of adequate telephone communication throughout the park is another vital need. The telephone system that is at present maintained on the west side of the park answers our needs only in a very small measure. In addition to the line being overloaded at present, it is practically impossible to communicate with the various rangers reached by this system.

The allotment for the construction of the bridge at Belton was completely wiped out by forest fires the past season. An item of $12,000 is included in the deficiency bill being considered by Congress at present for the construction of this bridge, and should this measure carry, steps will be taken at once to replace the present dangerous wooden structure.

The present water system at headquarters should be replaced by a gravity system, as it is extremely difficult to keep the system in operation during the cold winter months.

Among the most important needs of the road system within the park is the improvement of the North Fork Road, at least as far as Bowman Lake, so as to give automobile tourists access to this portion of the park.

When the Two Medicine Dam is closed and that area overflooded it will be necessary to reconstruct about 4 miles of the Two Medicine Road so as to raise it sufficiently above the part to be inundated.

The present Cut Bank Road should also be continued to a point about 5 miles from the end of the present road, as the hotel company is considering the erection of new chalets at that point.

The present road from Babb to the Canadian border running through the Blackfeet Indian Reservation should also be improved, as many stretches of this road are in a very dangerous condition, many reports having been received from autoists coming in from that direction.

To my mind a definite construction policy should be adopted for the park to cover a period of at least five years, so that definite plans may be made and adhered to covering the constructive methods to be used in opening up new roads, trails, etc. Such a policy would tend greatly to economize the work and would enable those in charge to more intelligently carry on the improvement and construction work within the parks.

ROCKY MOUNTAIN NATIONAL PARK.

L. CLAUDE WAY, Superintendent, Estes Park, Colo.

GENERAL STATEMENT.

The Rocky Mountain National Park was created by the act of January 26, 1915 (38 Stat., 798). Under the act approved February 14, 1917 (39 Stat., 916), entitled "An act to add certain lands to the Rocky Mountain National Park, Colorado," approximately 43 square miles have been added, making the present area of the park approximately 400 square miles. The first act provided that not more than $10,000 should be expended for maintenance, supervision, or improvement in any one year unless first expressly authorized by law. By the act of Congress approved March 1, 1919, the inhibition was removed. Exclusive jurisdiction over the above area has not yet been ceded to the Federal Government by the State of Colorado.

TRAVEL.

The lack of hotel accommodations, together with washout of roads between national park entrances and railroad terminals, prevented thousands of people from visiting this region this season. A canvass of three hotels and the Tourist Bureau of Denver shows that in Denver alone from 100 to 150 persons per day during July and August, or a total of between 6,200 and 9,200 persons, could not secure accommodations here, and hence did not visit the park. Each day a list of available rooms, if any, was telephoned to the Denver Tourist Bureau, the average number of rooms available per day being three or four to supply the demands of hundreds in Denver alone. I have not heard of one hotel in this region that was not booked to capacity for the entire season by June 1. Many of the hotels have kept a record of the number of people turned away for lack of room. This list totals 10,487 persons for the Estes Park and Longs Peak entrances alone, while approximately 3,000 were turned away at Grand Lake. These figures, in conjunction with the total travel listed below, afford ample proof of the popularity of this national park, also the need for additional hotels to accommodate the people, both on the eastern and the western slopes.

In giving the number of persons who visited the Rocky Mountain National Park this season I must again call attention to our method of counting, which is the same as that used in 1917 and 1918. We have no entrance gates, and our only means of counting is to count the number of machines and the number of occupants that pass a given point on the Longs Peak and Estes Park entrance roads. One man is stationed throughout the day on each of these roads at the expense of the Denver Tourist and Publicity Bureau, but under my control. A conservative estimate (arrived at by actual count on average days) of the number of persons missed by checkers when off duty being 30 per cent, this is given consideration in the final results or totals, the actual count being given for information as to States and foreign countries represented. I must also call attention to the fact that, in so far as different States and foreign countries are concerned, we have no means other than auto license (and, in the case of foreign countries, our office register) of determining where the people come from, and hundreds of people are listed as residents of Colorado, for the reason that they come in rent cars out of Denver and other valley cities. The absence of suitable control of park entrances is detrimental in many ways, chief among them being the impossibility of adequately getting information of value to the people, as well as to the park. Aside from the road washout period, travel into the park has been exceptionally heavy this year. The following tabulations show the number of persons visiting the Rocky Mountain National Park during the season of 1919:

Travel by States in the Rocky Mountain National Park, season of 1919, Estes Park and Longs Peak entrances.

State.	Autos.	Passengers.	State.	Autos.	Passengers.
Alabama	1	5	Nevada	1	7
Arkansas	17	74	New Hampshire	1	4
Arizona	2	7	New Jersey	8	20
California	37	155	New Mexico	5	16
Colorado	9,924	43,972	New York	19	69
Connecticut	1	11	North Carolina	1	1
District of Columbia	4	13	North Dakota	6	26
Delaware	1	5	Ohio	27	106
Florida	2	8	Oklahoma	306	1,232
Georgia	3	10	Oregon	1	5
Idaho	3	10	Pennsylvania	17	65
Illinois	119	514	Rhode Island	1	5
Indiana	10	45	South Carolina	1	1
Iowa	313	1,252	South Dakota	15	69
Kansas	700	2,919	Tennessee	8	14
Kentucky	4	13	Texas	110	440
Louisiana	5	24	Utah	5	25
Maine	1	2	Virginia	2	8
Maryland	1	3	Vermont	2	11
Massachusetts	7	30	Washington	4	20
Michigan	15	59	West Virginia	1	2
Minnesota	11	40	Wisconsin	7	28
Mississippi	4	16	Wyoming	312	1,311
Missouri	282	1,204			
Montana	9	39	Total	13,500	58,848
Nebraska	1,164	4,933			

The preceding figures are actual count; no estimate given of visitors missed by checkers. They were obtained by having men stationed at entrances, who counted the number of people in each automobile or other vehicle as they passed, the classification as to States being determined by the license number on each machine. It can be readily seen that many persons from States other than Colorado would hire machines in Denver or other points for a trip into the park, yet they must under this system be recorded as Colorado people. Again, all evening travel could not be recorded. Checkers were employed by the Tourist and Publicity Bureau of the Denver Civic and Commercial Association from May 30 to October 1, the count prior to and after those dates being obtained from hotel registers. From calculations made at different times after checking hours it is estimated that we failed to record 30 per cent of the people entering the National Park at these entrances.

Travel not classified by States.

	Autos.	Passengers.
Rocky Mountain Parks Transportation Co	1,023	8,374
Rent cars	1,449	8,637
B. P. O. E. convention	70	350
Total	2,542	17,361
ESTIMATED.		
Estes Park and Longs Peak entrances, missed by checkers	4,826	22,931
Grand Lake	11,000	55,000
Wild Basin, on foot or horseback	.....	5,000
Mummy Pass region, on foot or horseback	.....	1,500
Devil's Gulch	540	2,700
Visitors Oct. 13, 1918, to May 29, 1919	1,230	6,152
Total	17,596	93,283
RECAPITULATION.		
Private cars, classified by States	13,500	58,818
Rocky Mountain Parks Transportation Co	1,023	8,374
Rent cars	1,449	8,637
B. P. O. E. convention	70	350
Estimated	17,596	93,283
Grand total	33,638	169,492

Visitors from the following foreign countries were registered in the park this season: England 1, France 1, Canada 2, Norway 1, Denmark 1, Siam 1, Java 2, Japan 4, Holland 1, Russia 1, Hawaii 2, Switzerland 2; total visitors from foreign countries 19.

ROADS.

County and State roads within the national park and approaches thereto have not been in as good condition this year as in 1918. Due in part to the extreme dryness of this season, the roads would not hold up under the extremely heavy travel.

Big Thompson approach.—The work done last year by the State and county road officials in widening this road proved of great value this year in the handling of the heavy traffic. On August 1 a cloud-burst occurred which did considerable damage, flooding about 10 miles of the road below the forks and taking out one bridge, thus closing the road to travel. Temporary repairs were made, and the road was again passable at 5 p. m., August 2. Repair work continued until September 9, when the road was permanently closed to permit double tracking the entire distance. One hundred and ten thousand dollars will be spent on this work under Federal aid plan. The increased traffic makes double tracking a necessity and when completed it will be one of the best and most scenic roads in the country. It is expected that the work will be completed by June 1, 1920.

Longmont-Lyons approach.—This highway was greatly improved this year, considerable work being done by the Larimer County commissioners. This, in conjunction with work done by the Boulder County commissioners last year, adds greatly to the double-track distance between the valley and the national park. This road was open until July 31, when a cloud-burst occurred which washed out 8 miles of road and several bridges in Boulder County. Repair work began at once, but the damage was so great that the road was not open until September 10.

South St. Vrain approach.—This road is still gaining in popularity, due to the magnificent scenery and choice of routes via Longmont through Lyons and Allens Park, Boulder via Lyons and Allens Park, or Ward and Allens Park. Several miles of this road at the lower end have been double-tracked by Boulder County. I have been informed that the State highway commission favors double-tracking the road the entire distance to the national park, work to begin this winter. There is no question but what the State would be amply repaid for any money expended in improving this road. The cloud-burst on July 31, which washed out the Lyons-Longmont Road, also took out bridges and several miles of this road. Temporary repairs were made at once, only to be again washed out by floods. The road was finally placed in fair condition for travel August 17, and permanent repair work has been carried on as rapidly as possible.

Granby approach.—The Granby approach to Grand Lake has been in the usual poor condition. Several new bridges were constructed, while others have broken down

MAP OF ROCKY MOUNTAIN NATIONAL PARK

Note: Numbers on the map indicate the locations of the resorts and hotels bearing corresponding numbers, listed on pages 16-17-18

and have not been replaced. Local people are beginning to realize the importance of good roads and are insisting that the roads be improved, and apparently they will succeed.

General information on approaches.—The Big Thompson and South St. Vrain Roads are equally attractive from a scenic standpoint, the former following the Big Thompson River, which flows between perpendicular walls from 100 to 500 feet in height from the foothills to Estes Park, while the topography along the South St. Vrain changes from high, rolling country with distant views to valleys and deep canyons. People should enter by way of one route and leave by way of the other to get the best results from a trip to the national park. The chief inducement to travel the Lyons route is the shortening of the distance between Estes Park and Denver. While this route has great scenic value, it is not comparable to the Big Thompson or the South St. Vrain route.

Roads within the national park.—Approximately $200 was spent on the State and county roads within the national park by State and county officials. The Longs Peak Road has been in very poor condition this year, but at no time impassable. The Moraine Park Road has been in fair condition. The widening of this road on Moraine Park Hill last fall greatly improved this stretch, making it much safer for travel.

Highdrive Road.—This road was in very poor condition the early part of the season, but was improved later by the repair of bridges and culverts where necessary and by filling in chuck holes. This road was in fair condition during August. It was closed three days on account of bridge work.

Fall River Road.—This road, from the national park boundary to Horseshoe Park, was in very poor condition at the beginning of the season, but was improved later by replanking and replacing bridges and culverts, where necessary, blowing bowlders out of road, providing drainage on hills, and resurfacing the worst parts. This portion of the road was in fair condition during August.

The Fall River Road, from Horseshoe Park to the Shelter Cabin, is in very poor condition. No work has ben done on this section this year, with the exception of clearing out winter rock slides and temporary repair of retaining walls which had fallen down. This section should be resurfaced, widened the entire length, and proper drainage provided. Mr. E. E. Sommers, State highway commissioner for this district and chairman of the commission, has promised to do this work and put the entire road in first-class condition before asking the Government to accept the road. Nine thousand one hundred and forty-five feet of road has been constructed this season on the Eastern Slope, above the Shelter Cabin, carrying the road to approximately 5,000 feet of the highest point, at the head of Fall River Canyon. Considerable work has also been done above timber line beyond the completed portion. On the Western Slope work has progressed even more satisfactorily, 19,100 feet being completed and entire right of way cleared, bringing the completed portion 2,800 feet from the highest point and level ground. The contractors estimate that the road will be completed by July 15, 1920. While it is disappointing that this road will not be completed this fall, according to promise, the work has been pushed vigorously by Mr. E. E. Sommers, chairman of the State highway commission, and others, who deserve credit for their work. The State officials have definitely decided upon what is known as the Highline route, which affords wonderful views of the mountains and valleys.

The importance of this road to the traveler, the national park, and the State of Colorado, can not be overestimated. completing, as it will, connections between Estes Park and Grand Lake over the Continental Divide, making possible a circle trip to and from Denver, which for scenic beauty will not be surpassed in the world. It will be possible to complete the trip in three days' traveling time.

Mill Creek Road.—This road, from the junction with the Moraine Park Road to Mill Creek ranger station, was greatly improved by blowing out large boulders on which many autos have been damaged in the past. The portion from Hallowell Park to Mill Creek ranger station was difficult and dangerous of passage by wagons and impossible for autos. Since the completion of the work this year autos make the trip to the ranger station, which shortens the distance to Bierstadt Lake and Flattop Mountain. This work also makes possible and profitable the removal of dead fire-killed timber for cordwood, and we have had many inquiries for wood by local residents. With further and adequate improvements this road would be very popular. Mr. A. Griffith, who has a timber-sale area around Bierstadt Lake, improved the old wagon road between Mill Creek ranger station and the lake and is now hauling out dead saw timber and cordwood, cleaning out and greatly improving the shores of the lake.

Glacier Basin Road.—This road, from the junction with the Mill Creek Road to within 1½ miles of Bear Lake, has justified the expenditure for construction. The 1 mile cut-off built last year by private subscriptions has enticed hundreds of auto parties and campers into Glacier Basin. Considerable work has been done resurfacing and making additional turnouts on this mile, which should be double-tracked the entire distance and extended to Bear Lake at the earliest possible date.

Fern Lake Road.—One mile was partly constructed last fall with money contributed by Messrs. Stead, Tecker, Byerly, and Reed. No additional work has been done this season. This road should be completed to Fern Lake at the earliest possible date. The Fern Lake region is one of the most beautiful in the park, but is accessible at the present time only by foot or saddle horse over 5½ miles of very poor trail.

Beaver Creek Road.—This road is now used by wagons hauling out fire-killed timber. No work was done this year on account of lack of funds.

Pole Creek Road.—From Grand Lake to Pole Creek ranger station is now in condition for auto travel and has been extensively used this season by tourists on picnic and camping trips. This road opens up fire-killed timber, which is extensively used by local residents of Grand Lake. While this road is in fair condition, it should be improved and extended to the southern boundary of the National Park.

North Fork Road.—From Grand Lake to the junction with the Fall River Road this road has been in fair condition. Grand County and State road commissioners relocated and built 1½ miles, cutting out swampy ground, and I have been informed that additional work will be done by these officials next year. This is the first year that automobilists could travel this road with comfort. On my last trip I found two autos at Poudre Lakes, and the owners expressed their appreciation of the work done.

General road conditions.—Due to extreme dryness this season, it has been practically impossible to keep roads in good condition, and especially so since no adequate drainage is provided. Surfacing during the dry spells is readily ground to dust and carried off

the right of way by suction and winds, and even light rains would cause ruts and waste tons of material by depositing in forest growths alongside the road or carrying into streams. We have done what we could to overcome this, but the small amount of money available for all road work permits only an infinitesimal amount of drainage work, and we must concentrate our efforts on dangerous stretches and on bridges, making them passable and safe for the season. It is impossible under present allotments to do any permanent work, for there are so many places to cover. All bridges within the national park have done service for many years, and being of wood construction are in a dangerous condition. Three of them gave way under the weight of touring cars this season and had to be replaced by wooden structures. An examination shows that not one bridge within the national park has a sufficient factor of safety for the travel carried. The following is a summary of the road work done by us this season:

Name of road.	Length (feet).	Width (feet).	Nature of work.
Mill Creek Road, 3½ miles			Bowlders removed; chuck holes filled; partly resurfaced.
Bridges and culverts:			
One	15	14	Replanked.
Glacier Basin Road, 2 miles			6 new turnouts built and enlarged; 7 old turnouts resurfaced and raked; road construction, 600 feet to camping grounds.
Fall River Road (park boundary to Horseshoe Park) 1½ miles.			Bowlders removed; resurfaced and raked; chuck holes and ruts filled; ditched.
Bridges and culverts:			
One	30	16	Retreaded.
One	16	12	Do.
One	12	12	Rebuilt.
One	24	12	Replanked; retreaded.
One	3	12	Rebuilt.
Four	2	12	Do.
Highdrive Road, 2 miles			Bowlders removed; chuck holes and ruts filled; partly resurfaced.
Bridges and culverts:			
One	34	16	Replaced with guard railing; shortened 10 feet; fill 10 feet long, 5 feet deep, 16 feet wide
One	16	12	Rebuilt with guard railing.
One	5	12	Replanked and retreaded.
One	6	12	Do.
One	8	12	Do.
Pole Creek road, 2 miles			Graded and resurfaced; bowlders removed; ditched.
Bridges and culverts:			
One	8	12	Pole Bridge rebuilt.
One	9	12	Do.
One	12	12	Do.

TRAILS.

Due to extreme dryness and light snowfall last winter, our trails were not damaged to the usual extent. Because of the dangerous condition of the roads and bridges, it was considered advisable to concentrate all work on them; consequently no trail work has been done except necessary clearing out of fallen timber and corduroying the most dangerous bog holes when possible. This work was done by park rangers.

Name of trail.	Miles.	Points connected.
Flattop	18	Mill Creek Road and Grand Lake.
Hallett's Glacier	6½	Fall River Road, Lawn Lake, and Hallett's Glacier.
Ypsilon	2½	Hallett's Glacier Trail and Ypsilon Lake.
Storm Pass	4½	Glacier Basin and Long's Peak Inn.
Wind River	2½	Long's Peak Road and Wind River Road.
Bear Lake No. 1	1½	Glacier Basin Road and Bear Lake.
Bear Lake No. 2	1¾	Bear Lake and Bierstadt Lake.
Loch Vale	2½	Bear Lake Trail and Loch Vale.
Fern Lake	5½	Moraine Park Road and Fern Lake.
Steep Mountain	2	Pool and Mill Creek Ranger Station.
Odessa Lake	1¼	Fern Lake and Odessa Lake.
Deer Mountain	2	Fall River Road and Deer Mountain.
Bierstadt Lake	1	Glacier Basin Road and Bierstadt Lake.
Milner Pass	15	Fall River Road and Grand Lake Road.
Long's Peak	9	Long's Peak Inn and summit Long's Peak.
Lakes Nanita and Nakoni Trail	2	Flattop Trail, Lakes Nanita and Nakoni.
Total	77	

CONCESSIONS.

Transportation.—On May 13 a concession was granted to the Rocky Mountain Parks Transportation Co. for transportation within the Rocky Mountain National Park. This company has operated here for a number of years and has given excellent service. They have demonstrated the value of our concession policy and their services to the traveling public this season by the masterly manner in which they have met the transportation problem. Though handicapped by floods, which did great damage to the roads and increased their haul for freight and passengers by several miles, they have kept up their schedules from railroad terminals to and into the park, running their cars night and day when occasion demanded, serving the people, and accomplishing their object with little or no annoyance or inconvenience to the travelers. I know of no case where a traveler has been refused a passage by this company, either on scenic trips through the national park or from railroad terminals to or from the park, except during the time that bridges on entrance roads were washed out. The efficiency of their service is further proven by their popularity. In previous years one or two hundred people per week over the Fall River or Highdrive Roads in rent cars was considered a good week at the price of $19 per seven-passenger car, while under the concession plan one or more persons make the trip with additional mileage at $4 per passenger and two trips daily. One thousand nine hundred and fifty-six passengers were carried on this trip between June 15 and August 31. As high as 150 persons have made this trip in one day in Transportation Co. machines. The Longs Peak schedule has also been popular, 1,257 persons being carried between June 15 and August 31, at $1.25 one way, $2.50 round trip, where in the past as high as $22 has been charged for this trip by jitney drivers. In addition to schedule trips, this company operates a fleet of seven-passenger White touring cars, giving special any-hour service by trip or hour. Trips and prices are given below. The handling of tourists from railroad terminals into the park has taxed the company to the utmost, due to the immense amount of traffic this year. It is estimated that an average of 150 persons daily were handled by the company between June 15 and August 31 from railroad terminals, and in addition on one occasion 350 extra passengers were handled one day in and one day out without curtailing the service to regular travel. This condition has existed on several occasions this season without one complaint being filed against the service given. I believe than it is obvious that this could not have been done without a reliable company, under contract, and depending upon haphazard service by rent-car owners, operating when and where they please. The following service has been given by the company:

Automobile schedules, the Rocky Mountain Parks Transportation Co., sight-seeing trips.

Highdrive Circle (including Highdrive and part of Fall River Road).—Leaves Estes Park 9 a. m., returning 11 a. m.; round trip, per passenger, $2.50.

Fall River Drive (including all of Fall River Road).—Leaves Estes Park 9 a. m., returning 12 noon; round trip, per passenger, $3.50.

Fall River and Highdrive (including all of Fall River and Highdrive Roads).—Leaves Estes Park 2.30 p. m., returning 6 p. m.; round trip, per passenger, $4.

(Any of the above sight-seeing trips can be taken from Moraine Park, providing six or more persons desire service.)

Longs Peak Drive (via Marys Lake).—Leaves Estes Park 2.30 p. m., returning 5.30 p. m.; round trip, per passenger, $2.50; one way, per passenger, $1.25.

Special service (White touring cars).—Straight running time, per hour, $6; picnic parties, running time, per hour, $6; waiting time, per hour, $4; shopping trips, per hour, $4.

Touring car rates.

		Per person.	Minimum charge.
1	Fish Hatchery	$1.25	$5.25
2	Horseshoe Park and Falls	2.00	8.50
3	Fall River to Chasm Falls	2.75	11.50
4	Fall River Road	4.00	17.00
5	Highdrive	2.50	10.50
6	Moraine Park post office	1.25	5.25
7	Moraine Park to Fern Lake Trail	1.50	6.25
8	Y. M. C. A. Conference Grounds	1.25	5.25
9	Stanley Hotel	2.50	10.50
10	Wind River Road	2.00	8.50
11	Longs Peak Inn	2.50	10.50
12	Hewes-Kirkwood Inn	3.00	12.50
13	Longs Peak drive	3.50	15.00
14	Copeland Lake	4.00	17.00
15	Wild Basin	4.50	19.00
16	Allens Park post office	5.00	21.00
17	Ward	7.50	31.50
18	Lyons, via South St. Vrain Canyon	7.00	30.00
19	Gem Lake Trail	.75	3.25
20	Lesters Hotel	1.25	5.25
21	Horizon	1.50	6.25
22	McGraw's ranch	2.50	10.50
23	Devils Gulch-Big Thompson	3.50	15.00
24	Big Thompson Canyon to Dam	5.00	21.00
25	Devils Gulch-Big Thompson to Dam	5.00	21.00
26	Around Prospect Mountain	1.75	8.50

Touring car rates—Continued.

		Per person.	Minimum charge.
	COMBINATION TRIPS.		
27	Trips Nos. 3 and 5	$3.25	$14.00
28	Trips Nos. 4 and 5	4.50	19.00
29	Trips Nos. 3, 5, 7, and 8	4.50	19.00
30	Trips Nos. 9 and 10	3.25	14.00
31	Trips Nos. 15 and 16	5.50	23.00
32	Trips Nos. 15 and 17	8.00	34.00
33	Trips Nos. 15 and 18	7.50	31.50
34	Trips Nos. 20 and 23	3.75	15.75
35	Trips Nos. 4, 5, and 7	5.00	21.00
36	Trips Nos. 20, 22, and 23	4.75	20.25
37	Trips Nos. 20 and 25	5.25	22.00
38	Trips Nos. 6, 8, and 9	3.25	14.00
39	Trips Nos. 6, 8, 9, and 10	4.00	17.00
40	Trips Nos. 5, 6, and 8	3.50	15.00
41	Trips Nos. 5, 6, 8, and 10	4.00	17.00
42	Trips Nos. 5, 6, 8, and 9	4.50	19.00
43	Trips Nos. 4, 6, 8, 9, and 10	5.25	22.00

For this service the Transportation Co., under contract, own and operate the following: Twenty-four 10-passenger cars, eight 7-passenger cars, five 2-ton trucks, two 5-ton trucks.

Orders for additional equipment have been placed by this company, but it has not been possible to secure deliveries to date. Anticipating increased travel to this park next season, orders for additional equipment will be placed.

Hotels, lodges, camps.—Permits have been issued as follows:

Name.	Proprietor.	Capacity.	Location.
Sprague's Hotel	A. E. Sprague	50	Glacier Basin.
Lodges:			
Forest Inn	F. D. Tecker	50	Pool.
Fern Lodge	F. W. Byerly	50	Fern Lake.
Bear Lake Lodge	A. E. Brown	50	Bear Lake.
Camps:			
Timberline	E. A. Mills	10	Long's Peak.
Lawn Lake	Bradley & Patrick	15	Lawn Lake.

The nine other hotels within the boundaries of the park are located on private property, and are not under the jurisdiction of the National Park Service.

CONSTRUCTION OF BUILDINGS.

Superintendent's Barn.—Size 14 by 20 feet; 5 stalls, with hay loft, grain and saddle room; height of gable 16 feet; frame construction; to be used for winter housing of saddle horses used on official business by the superintendent.

Fire-tool caches.—Three fire-tool caches, log construction, size 6 by 8 by 6 feet front, 4 feet rear, containing fire-fighting equipment for 10 men, have been installed. The new caches replace the boxes originally installed and are large enough to afford shelter in case of emergency, thus serving a double purpose.

Kitchen and cesspool.—A kitchen, size 12 by 14 feet, was added to Mill Creek ranger station and the cesspool rebuilt.

Repair of buildings.

Name.	Construction.	Nature of work.
Mill Creek ranger station	Log	New ceiling and floor; 3 windows and 3 doors installed; balance of chinking done; fireplace constructed; all ranger labor.
Pole Creek ranger station	do	Porch and stairway added; general spring repairs; all ranger labor.

TELEPHONE LINES.

General statement.—All telephone lines have given excellent service this season, practically the only work necessary after spring repairs being the replacing of lightning fuses.

Construction.—Fall River line, 2 miles, now connecting Fall River Shelter Cabin and the road camp; Pole Creek line, location changed from connection with Mountain States Telephone & Telegraph Co. toll line, Hot Sulphur Springs to Grand Lake, now connecting with Flattop line, giving connection with the superintendent's office, over all-Government line, total distance reconstructed, 3½ miles, using new material on 1¾ miles.

Maintenance and repair.—Spring repair work on Allen's Park, Mill Creek, Flattop, and Fall River lines was heavy this season, due to fallen trees and heavy snow, which clung to and broke wires. By beginning in February we were able to complete this work before the official park opening date. Through reconstruction, location, and care taken in repairs, I feel that in the future we will have a minimum of spring repair work on telephone lines, our most important change being relocating 2 miles of the Mill Creek telephone line from swamp to high ground with all-pole construction. Total mileage of telephone lines, 61.

Great appreciation is shown by tourists of our telephone system, with telephones installed along roads and trails, these creating a feeling of confidence and safety to a person unaccustomed to the wilds.

CAMPING GROUNDS.

Use of our free public camping grounds in Glacier Basin has increased 100 per cent this season. A new road from the Glacier Basin Road, constructed in July, added greatly to the comfort and convenience of campers. The number of camp sites has been increased by cutting out underbrush and cleaning up additional ground. Many persons have expressed to me their appreciation of our work and forethought in selecting so beautiful a location. The need is great for additional improved camping grounds, and I trust that sufficient funds will be available next year to install them. Cross-country travel by auto is increasing by leaps and bounds, and we should be prepared to supply the needs of the people.

Every effort was made by the people of Estes Park to secure sufficient ground near the village for free camping grounds to accommodate late arrivals and others who did not wish to camp in the hills. Sufficient money was obtained by private subscription, but thus far no one would sell ground for this purpose. Efforts to secure suitable sites are still being made, with hopes of success before next season.

Mr. F. O. Stanley established a public camping ground in Tuxedo Park, which has been well patronized and appreciated this season. A fee of 50 cents per day per auto is charged for camping privileges to cover the expense of caretaker, installation of conveniences, etc. The camp ground is located approximately 3 miles from the village of Estes Park, and 5 miles from our free public camping grounds.

The elimination of camping along public roads this season has added greatly to the pleasure and safety of the people using the roads. No accidents from horses running through fright at blankets, tents, etc., have been reported.

The Colorado Mountain Club held its second camp in Wild Basin during August, having as its guests members of the Prairie Club of Chicago, the minimum attendance being 100, the maximum 150.

NATURAL CONDITIONS.

Glaciers.—"The Geologic Story of the Rocky Mountain National Park," by Willis T. Lee, Ph. D., geologist, United States Geological Survey, has been of great value to both scientists and laymen, in their study of glacial action in this region. Our supply of this publication was early exhausted to the disappointment of hundreds of people who made inquiries later and learned that they must send to Washington for copies. This work has stimulated interest to an unbelievable extent, and inquiries regarding glaciers, moraines, etc., have been of daily occurrence at our office and of the rangers. Seen from the valleys this year, the glaciers have been disappointing, due to the small amount of snowfall last winter, and since the majority of the light storms in high altitudes this summer fell as rain instead of snow, this resulted in practically all the snow being washed from the glaciers, leaving the ice bare, which did not show up well from a distance. This condition, however, had its advantages, affording, as it did, an excellent opportunity to study the ice formation and other glacial conditions.

Of the immense glaciers that once were, but five remnants remain, Hallett's, Sprague's, Tyndall, Andrews, and Taylor. Especial interest has been manifested in Hallett's and Andrews glaciers this season. In Andrews Glacier, crevasses opened this season, this being the first time, so far as known, that this has occurred. Hallett's Glacier, the largest glacier within the park boundaries, each year takes new and fantastic shapes. Old residents and guides in this section report Hallett's Glacier as being more wonderful this year than at any time during the past 20 years. I quote from a report made to me by Mr. Robert Collier, licensed national park guide:

Report on Hallett's Glacier, by Robert Collier.—"On August 18, with a party of five, I visited Hallett's Glacier, on the north side of Hague's Peak. The glacier this year is open in a wonderful way. The big semicircular bank has three main crevasses open, the usual one in the center being about the best. We noted this crevasse going down about 25 feet below the level of the bank outside. As we went down we could look in and down toward the north into an immense room about 150 feet high and 50 to 60 feet broad. From the roof of the room a large number of icicles hung, some of them being 35 to 40 feet long. In places on the roof large masses of snow had settled, and the icicles hanging from them were twisted in many curious shapes. Because of the overhanging snow it was not deemed wise to go very far into this crevasse, but I believe that by going very early in the morning, while the mass is still cold, and with proper ropes this whole immense crevasse could be easily explored.

"A large crevasse on the north bank of the glacier was open for approximately 300 yards, and on the lower end you could look down approximately 100 feet into the ice. We climbed up above the main crevasse in the middle, where I found new cracks opening about every 6 to 8 feet, so that extreme care had to be used in crossing. Some places that I pricked through with my staff I looked into. These cracks were spread, so that you could look down anywhere from 75 to 100 feet into the ice.

"At the top of the glacier a number of interesting bergshrunds, where the ice was parting from the snow, were explored. These were not so deep, but showed a great many interesting snow crystals and snow formations. The small lake at the bottom of the glacier had a number of icebergs floating around, which showed some red fungus coloration, typical of the ice.

"There was also another crevasse, extending vertically up the bank, a condition which I had never before observed, but on account of the cracked condition of the ice I was unable to explore this crevasse. The crevasse on the south side was small and comparatively filled up, so that it did not seem advisable to explore it. On the whole, the glacier is in the finest shape for observation and exploration that I have ever observed it."

The red fungus coloration referred to above is discussed in my report of February 15, which I now resubmit.

Report on red snow in the Rocky Mountain National Park.—"I feel that red snow can be considered as one of the notable phenomena of this national park. A party of tourists who visited Hallett's Glacier the same day after the discovery of red snow was made took as much interest in it, after its nature had been explained to them, as they did in the purely scenic features of the glacier. Certainly no one could fail to be impressed with this great mass of color, knowing that it is composed of countless billions of tiny living creatures which have the power of movement, growth, and reproduction, and this in a medium generally considered devoid of life.

"The general appearance is that of a well-defined pink band, extending along Hallett's Glacier along the lower edge where the surface becomes nearly level. This band, I should say, is about 100 feet wide, its upper edge being very even and about as long as the glacier—that is, about one-half mile. A closer inspection discloses the fact that the color is concentrated in the hollows of the furrowed surface of the snow and reaches its maximum density about one-quarter inch below the surface. A slight scraping will produce in some places streaks of an almost blood red. A handful of the snow taken up and allowed to melt away will leave a powdery red stain.

"This phenomenon was first discovered in the northern part of the American continent in comparatively recent times. Various explanations were offered, some of them almost as absurd as that of the natives of the Caucasus Mountains, who regard the same appearance there as a manifestation of the blood of saints. It is now known that the color is due to the presence of countless numbers of a minute organism (protococcus) related to the algæ. It is called by some *Spirella nivalis,* but I am not sure that this is the name finally agreed upon by men of science. Like many other low microscopic forms of life, this one has characteristics of both the animal and vegetable kingdoms, and belongs, strictly speaking, to neither. In the early stages of its development it has a tail and seems to possess the power of motion. Later it seems to possess a purely vegetable nature. The species is believed to reproduce itself like the amœba and other unicellar organisms by simple division. This species has introduced itself into the United States within the past 10 years. For instance, it was not formerly known in Glacier National Park, but is now found there on all the glaciers. It has been noted in Mount Rainier National Park and in other northerly locations. Essentially an arctic species, it seems to be extending southward in the mountains, finding a habitat on the large permanent ice sheets. So far as I know it has not been reported elsewhere in Colorado. I am confident that it does not occur as yet in the Rocky Mountain National Park except on Hallett's Glacier. It is possible that this is the first official report of this phenomenon at this latiude.

"Several interesting questions present themselves. Will this protococcus become established still further south on ice masses, such as the Arapahoe Glacier? Will the area covered on Hallett's Glacier increase, diminish, or remain the same? Only time and further investigation will answer these questions. Also, it is somewhat of a mystery how the spore is carried over such great distances. Possibly it is borne on the Chinook winds."

RANGER FORCE.

The ranger force is entirely inadequate. It is impossible for three rangers to satisfactorily patrol the 400 square miles of territory embraced in this park, composing, as it does, some of the wildest, roughest country in the United States. They can not even adequately protect the park from fires resulting from natural causes. Add to this the hundreds of campers in the wild sections of the park, many of them careless with their camp fires, and the situation is appalling. For police protection alone there should be at least seven permanent rangers throughout the year and five temporary rangers from May 15 to October 1 to protect from accidents the thousands of people using this park, by regulating the speed limit of automobiles, protection of streams, protection of game fish, and general field administration work.

WILD ANIMALS.

The general assembly of the State of Colorado recently passed an act (S. B. No. 66) creating and establishing the Colorado State Game Refuge, which embraces a section of the Colorado National Forest adjoining that part of the Rocky Mountain National Park lying east of the Continental Divide, thus affording much needed protection to game that stray beyond the National Park boundaries during the winter months, also game located within the game refuge the year long. This step will add greatly to the number of game, which the people realize is a great asset to Colorado. State Game and Fish Commissioner Parvin and his representatives are cooperating with us in every possible way for the protection of game in this section. The increase in game and their condition this season is very satisfactory. Due to extreme dryness, game animals have not been as numerous in low altitudes during July and August this year as last. During the spring months, however, the increase was apparent. While on an inspection trip in early June I counted 127 deer, 24 mountain sheep, and 33 elk along one road. There is no question but that the protection afforded by the State game refuge adjoining the national park will add to the increase of game in this section.

Elk are native to this section, but were exterminated by hunters years ago. A herd shipped in from the Yellowstone National Park formed the nucleus of our present herds, which now number five. We have no authentic data on the increase this year over last, though many calves have been reported by local residents. All animals seen have been in excellent condition. It is estimated that there are about 80 elk in the park.

Mountain sheep show a remarkable increase this year. It is disappointing that but few herds have been seen along the roads in low altitudes this season, due, I believe, to extreme dryness and the unusual number of flies. Mountain sheep have been seen in large bands by every party that has gone to the crater on Specimen Mountain this season, one party counting 225 animals, while numerous large bands have been seen by tourists on other high ranges. Once seen by any person among the crags and rocks of the wild country, the picture is well worth the effort necessary and is one never forgotten. One ram reported dead from old age had a horn spread of 3 feet 4 inches and 11 inches circumference. Persistent reports have come in of scabies among our mountain sheep, but we have not been able to verify these reports.

Deer.—This beautiful and graceful animal is now more plentiful in the park than any other animal. Large herds, numbering from 10 to 100, are commonly seen during the winter and early spring and as late as June 15, when the herds break up and go to higher altitudes within the park, where they are seen daily by parties traveling over the trails, usually in herds of from two to six, and are occasionally seen along the valley roads. They are more shy than the mountain sheep, due, no doubt, to the fact that they have not been protected for so long a period. Judging from an occasional encounter with them, I feel that within a few years, with adequate protection, they will be seen daily in large herds along the valley roads as well as in the wilder country. It has not been possible to get an accurate estimate of the increase, but, judging from the number of fawns seen, the increase must have been large. There have been no reports this year of deer in anything but first-class condition.

Beaver.—Colonies are very numerous and on the increase in the national park. Their workings line the streams, and can be seen in many places within 20 feet of the road, affording a wonderful opportunity to study these interesting animals. In several cases of colonies on private lands they have become so numerous that owners have found it necessary to secure permits from State officials to trap them to prevent destruction of land by flooding and destruction of aspen groves. Trapping on national park lands is not permitted, and very little damage is done to park lands by beaver. Since they are not molested on park lands, it is now possible in certain localities to see beaver working in daylight, also to secure pictures.

Bear, while native to this section, are seldom seen. Three silver tips, three brown, and six black bears were reported in the park this season, five being seen crossing main roads in low altitudes.

Predatory animals.—We have found the remains of five deer and six sheep killed by predatory animals this year. Reports of lions seen have been more numerous this year, and they are undoubtedly on the increase in this park. Fifteen coyotes and seven bobcats have been killed by park officers.

FISH.

Fishing conditions during the State open season were very good and afforded excellent sport to anglers. Through cooperation with the Colorado State hatcheries, located within the park boundaries, the following streams and lakes have been stocked during the past year:

Name.	Number.	Species.
Big Thompson	60,000	Eastern Brook.
Fall River	80,000	Do.
Glacier Creek	60,000	Do.

Plans are being perfected to establish breeding ponds along streams and lakes within the park, this method being necessary to get the best results from the planting of fry, the loss under the present method being so great that it is impossible to raise enough fish to supply the demands of the thousands of travelers within the National Park who enjoy the sport of trout fishing. Fish fries held in the open are very popular, those given by Howard James, of the Elkhorn Lodge, being particularly famous. Several of the guests from the hotels pool their catches, invite from 50 to 100 friends and acquaintances, and have their picnics in the shade of pines or aspens along one of the many streams within the boundaries of the National Park.

FOREST FIRES.

The season has been especially trying from the forest-fire standpoint, due to extreme dryness and lack of adequate patrol force. We have, however, succeeded in preventing any serious fires in the park by being constantly on the alert and responding to fire calls instantly, thus preventing them from spreading. We have extinguished 17 fires this season, the largest covering approximately 2 acres, with little or no loss to natural conditions. We have received the heartiest cooperation from the Rocky Mountain Parks Transportation Co. and from local people, without whose assistance our loss would have been great.

WINTER SPORTS.

In addition to the annual winter sports outing of the Colorado Mountain Club, several other parties enjoyed snowshoeing, skiing, and tobogganing at the Fern Lake run during February and March. This form of outing has an ever-increasing number of enthusiasts and is becoming deservedly popular. The number of participants would have been double this year had the accommodations been available. Those who were fortunate enough to see the hills in their winter covering of snow became converts who look forward to the next outing.

ACCIDENTS.

I regret to report two fatal accidents in the park in August of 1918.

On August 2, 1918, Miss F. E. Frost, aged 19, of Sterling, Colo., in company with Mr. Homer Thomson, attempted to cross a snow bank above the Fall River Road. Miss Frost lost her footing and in falling pulled Mr. Thomson off his feet. Before they could recover, they were sliding head foremost down the bank. Approximately 500 feet from the start of the slide a large rock protruded above the snow. Miss Frost struck this rock, and continued to roll for a distance of approximately 100 feet, finally falling over a ledge and lodging in a snow bank at the base. In some manner, a rock weighing in the neighborhood of 400 pounds, fell on Miss Frost, killing her instantly. She also received a death-dealing wound on the head. Mr. Thomson continued to slide approximately 500 feet, lodging in the trees at the base of the snow bank and receiving 50 slight wounds,

from which he recovered. The slope is at least 60 degrees, and Mr. Thomson stated that he did not think he had slid 50 feet before he lost consciousness.

On August 22, 1918, Rev. E. F. Kimmelshuhe, of Monmouth, Ill., was driving up the Fall River Road. In the party were Mrs. Kimmelshuhe and two sons, aged 11 and 17, and Mrs. C. W. Woods, also of Monmouth, Ill. At a point approximately one-half mile above the 13-mile post the automobile driven by Mr. Kimmelshuhe pitched over the bank, and landed bottom side up on the road below, about half way on the switchback, Mr. Kimmelshuhe being the only member of the party to escape death. The point where the machine left the road was not considered dangerous by experienced drivers.

Twenty-two minor accidents occurred within the park, all due to violation of automobile regulations, the majority of cases being collisions between saddle horses and autos, resulting in minor injuries to horses and riders. These accidents were unavoidable with the limited ranger force available.

LAFAYETTE NATIONAL PARK.

GEORGE B. DORR, Superintendent, Bar Harbor, Me.

GENERAL STATEMENT.

The principal fact which stands out above all others in the history of the Lafayette National Park during the year just past is its birth, the Sieur de Monts National Monument having become the Lafayette National Park by the President's signing the bill creating it on February 26, 1919.

This establishes the first national park to the east of the Mississippi River and marks an important new departure in park policy by the Secretary of the Interior and the Director of the National Park Service. The bill was passed unanimously by both House and Senate, and the action of the administration in this new departure has been warmly approved upon every side. This is not only the first national park in the eastern States, but the first in the country actually bordering upon the sea and adding its refreshment and appeal to those of a forested and mountainous land. The new departure is important also as opening the way toward the preservation under Government control of other areas of exceptional interest and beauty in the eastern and central portions of the continent. Such areas in these long occupied and settled States need a different policy and treatment from the extensive western tracts of mountain, plain, and forest. Hence the work of the National Park Service in the Lafayette National Park is creative in an important sense, dealing with new conditions and involving the solution of new problems. It is concerned with the intensive development of a relatively limited but singularly interesting area in a peopled region where human associations replace in a measure the appeal of far-extending wildness made in other parks. In it, however, one great element of wildness that must endure forever enters in uniquely—that of contact with the ocean and the sight from mountainous heights of its great plain of waters stretching boundlessly away till hidden by the curvature of the earth.

A great human association has been established with that ocean since the creation of this park began. The youth and manhood of the Nation have streamed across it in a great crusading movement and, with their end achieved, have returned—in lessened numbers. The wave of generous feeling that flooded the whole country during this period has recorded itself in the name the park was given, made doubly appropriate by the early ownership by France of the Acadian region within whose bounds it lies, and by its broad outlook on that dangerous highway which brought our aid to France, as it once had brought her aid to us.

EXTENSION OF THE PARK.

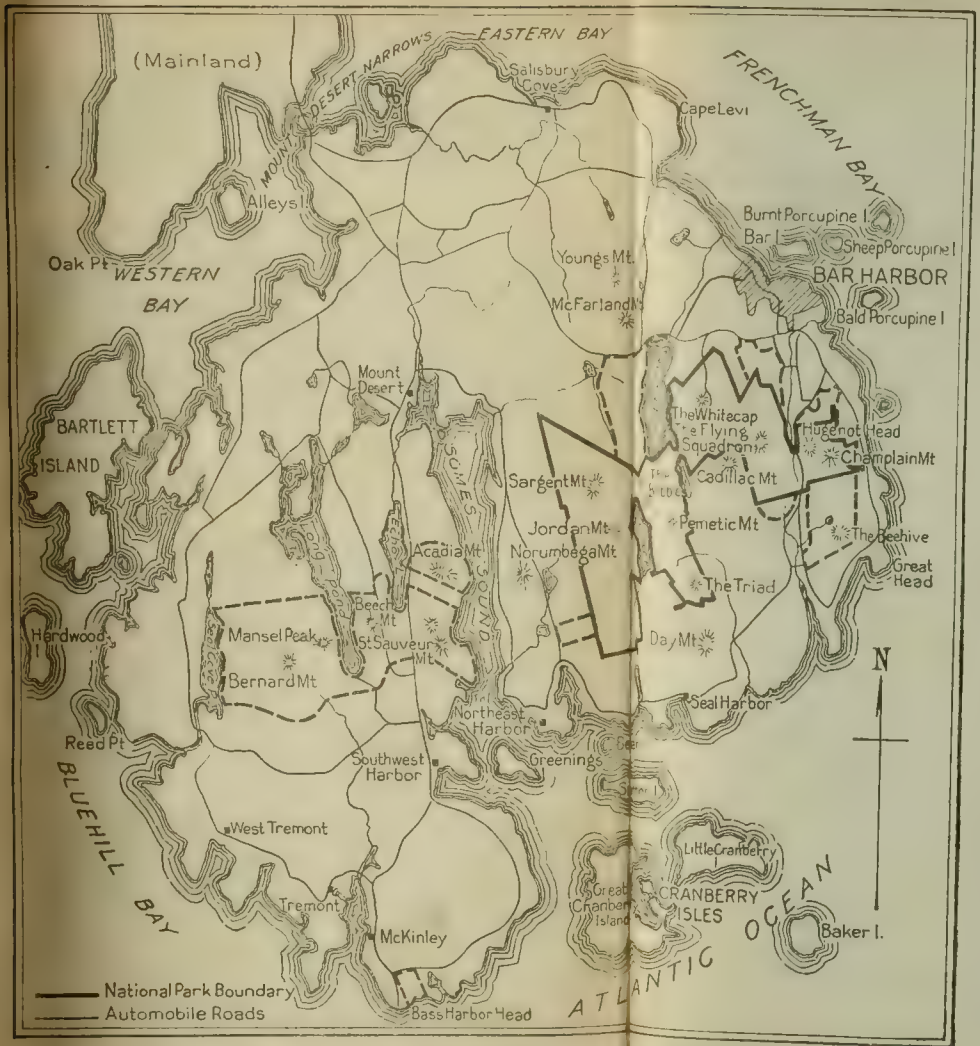
The Lafayette National Park is still in process of creation in regard to lands. Formed by gift to the National Government, its bounds are growing steadily through further gift. This involves a constant complicated study of old deeds and titles, whose defects must be searched out and cleared before the Government, with its high standard of requirement, can accept them. This has been one of the principal works undertaken during the past year by the park administration. Each tract of land whose ownership is offered to the park or sought for it means a separate—and often long—study in the county records.

OLD DEEDS AND TITLES.

All deeds and titles on the island go back ultimately to three sources: First, a gift of its western half by the Commonwealth of Massachusetts, made shortly after the foundation of the country, to John Bernard, son of the last colonial governor of Massachusetts, to whom the whole island had been originally granted by that Province; second, a gift of its eastern half to the granddaughter of Antoine de la Mothe Cadillac, a soldier of Acadia, to whom it had been granted a century before by the Province of Quebec and the Court of France; and, third, to early settlers' rights accepted by the General Court of Massachusetts when it made these grants. Two maps prepared by order of the Massachusetts court to show these accepted rights are still extant, though barely rescued from destruction: The Peters plan, so called, of the eastern half of the island, prepared by an ancestor of the region's present Representative in Congress, Hon. John A. Peters; and the Salem Town plan of the western half, made by a bearer of that singular name. These maps are being photographed for the park to preserve their record and to show the island as it was at the beginning of its present occupation; and all the studies that are being made of deeds and titles are being placed on record, also, in bound volumes.

ESTABLISHMENT OF OFFICE AND RANGER FORCE.

The next important fact connected with the Lafayette National Park during the past year has been the establishment of its office and administration, the appointment of an assistant superintendent of rangers, and of a clerk-stenographer. This last office is one of peculiar importance in the Lafayette National Park, as it involves not only the performance of the usual clerical duties of such a position, but the intelligent answering, in the superintendent's stead, of a constant stream of letters and inquiries, the tactful and friendly reception of visitors to the office in a place of great resort, and the gaining of a familiarity not readily acquired with local conditions in a long-settled region. All



MAP OF LAFAYETTE NATIONAL PARK MOUNT DESERT ISLAND MAINE.

The broken boundary lines indicate the approximate limits of additional lands to be deeded to the United States as a part of the Lafayette National Park.

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this has been most admirably done since the beginning of last winter by Mrs. Richard M. Daly, of whose work in a difficult and new position the superintendent can not speak too highly, while her previous experience in the Department of the Interior at Washington has been of the utmost value to him in the systematic organization of the national-park office and the introduction of National Park Service methods into its work.

One respect in which the duties of the superintendent and his assistants in the Lafayette National Park are uniquely different from what obtains in other national parks, springs from the fact that the park is still in process of formation, in a territorial sense and needs for completion the awakened interest of its visitors in its ideals and plans. This gives it a distinctly missionary place and work to do.

WILD LIFE.

The ranger service as organized has proved most efficient. Hunting over the park lands has been checked, if not entirely stopped; the ruffed grouse, the most important game bird of the region, whose numbers have been decreasing to an alarming extent for a whole generation past, has largely increased in number during the past season in the park's protected area; hundreds of ducks, migrating southward, may now be seen on its secluded lakes; and tracks of deer are frequent in its wilder portions. The greatest difficulty encountered in regard to these latter comes not from men but dogs, who, hunting generally in couples, pursue all game from deer to hares and foxes through the woods without respect to boundaries or laws.

Among the interesting incidents of the park's wild life history during the past year was the birth at a wild spot within its bounds of two American eagles, in a nest placed in the top of a dead rock maple, some 50 feet above the ground. The parent eagles commenced nest building almost immediately after the President signed the bill creating the park and were watched by one of the rangers, Mr. John Rich, as they circled above the chosen spot. From that time on he kept the nest under observation, and the eagles, both young and old, became accustomed to human presence, and later, when the young birds grew to size, some remarkable photographs were secured by the aid of an extension ladder run up into the close neighborhood of the nest. As this bird is not only one of the most splendid of our American birds, but is the national emblem, an enlargement of one of these pictures was forwarded by the superintendent to the President at Washington.

Two young beavers have been recently presented to the park, and others are to follow. Originally they abounded on the island, and old dams of their construction still remain. Admirable opportunity exists for restoring their communities under the park's protection, and it will be interesting to bring them back and reestablish them in their native haunts.

VISITORS.

The park this season has had many visitors distinguished in the Nation's life. Among them was the governor of the neighboring State of New Hampshire, who also took the keenest interest in what he termed "New England's national park," spending a number of days in it with its superintendent, its ornithologist, and others. All visitors have gone away with warm expressions of what their stay has meant to them and of their desire to extend to others knowledge of the opportunities of the park for summer recreation. In the early season a large detachment, also from the Appalachian Club, came down and stayed for 10 days at Seal Harbor, at the southern border of the park, visiting its points of interest and climbing its mountains with great enjoyment.

PUBLICITY.

Extensive publicity has been given the park this year by magazines and newspapers. Foremost among the articles that have been written upon it stands an excellent illustrated paper in the August Munsey Magazine, written by William S. Bridgeman. Another, notable for its good descriptions, was that of Mervin J. Curl, of the Boston Herald staff, who came down and stayed for several days for the purpose of writing it. It appeared in the Sunday Boston Herald of August 10, 1919. A third good illustrated article, exhibiting the wide range of interest taken in the park, is one which appeared in the Haynes Pioneer, an automobile periodical published in Indiana, which reaches automobile owners over the whole country, east and west.

NATURAL HISTORY.

The development of the natural-history interests of the park has been proceeding rapidly this year. The Secretary of the Interior has appointed, under the title of ornithologist, Mr. Henry Lane Eno, of Princeton University, in charge of the bird life of the park; and has similarly appointed Mr. Edward L. Rand, of Boston, secretary of the New England Botanical Society, its botanist. Both, serving at a nominal salary, take deep interest in their work, and each is gathering the material for a book upon his subject. A third branch of natural-history study, that of the park's entomology, has also been provided for by the superintendent, who has secured, without official appointment, the services of Mr. Charles W. Johnson, curator of the Boston Natural History Museum and one of the leading entomologists of the country, for the seasonal study of the park's varied insect life until material shall have been gathered for a book of authority upon it. And the director of the United States Geological Survey has promised his interest in securing, as funds become available, a thorough study of the park and island, which will make their age-long geologic history available to all.

WEATHER OBSERVATIONS.

Weather observations for the Government, in continuation of a long series privately made by the superintendent, on record now at Washington, has been undertaken by the park, Mr. A. S. Dockham, of the ranger service, being placed in charge.

CONSTRUCTION WORK.

Construction of important mountain and woodland paths has been started this year on Flying Squadron Mountain, where the Secretary of the Interior has announced plans for a noble memorial to our fallen airmen, and at the Champlain Mountain entrance from Bar Harbor, itself the point of main approach to both Mount Desert Island and the park.

BUILDINGS.

A building was erected (approximately 18 by 30 feet in size) at a suitable point near the northern foot of Champlain Mountain for the storage of explosive to be used on road and trail construction.

PURCHASE OF AUTOMOBILE.

Under authority given by its last year's appropriation, an automobile for the park service was purchased, and has proved of the greatest value in its work and has rendered constant service without mishap.

PEACE TREE PLANTING.

In the early summer an interesting ceremony took place at the Sieur de Monts Spring entrance to the Flying Squadron Mountain, beneath the bold crag selected for the airmen's memorial—the planting of two "peace trees," the one a pine representing the East and the State of Maine, the Pine Tree State; the other a Sequoia, representing the West and California. These were presented by Dr. Robert Abbe, of New York; Dr. Charles W. Eliot, president emeritus of Harvard, and the superintendent of the park laid the first spadefuls of earth to plant them, and children followed them to represent the future.

GIFT OF A LETTER FROM GENERAL LAFAYETTE.

The most recent among an interesting series of gifts made to the park this summer (the others being chiefly lands) is an autograph letter written by General Lafayette on the occasion of his return to this country in 1825. This letter, purchased for the park, will be framed and placed on view where all may see it in the national-park office. It reads as follows:

General MARQUIS DE LAFAYETTE,
ALBANY, *June 13th, 1825.*

RICHARD FOREST, Esquire, Department of State, Washington City:

Mr. Clay had informed me that such letters as had a chance to meet me at Louisville were sent there, that the posterior packets were detained at Washington. He therefore invited me to ask their being sent from the state office to any place where they could meet us. You know, my dear sir, that those packets of letters, whatever be their volume, have been hitherto forwarded by the stage, nor do I understand in what other way I could get them. The letters I have received from family and friends allude to an anterior correspondence the most of which render part of them unintelligible and unanswerable. I must therefore claim your kindness to have those packets sent to me as soon and as safely as possible from Washington and also from Louisville as you know in whose hands they have been deposited. I am this morning setting out for Boston where anything you please to send will find me until the twentieth of this month. I shall hence visit the states of Maine, New Hampshire and Vermont so as to be returned to Albany on the twenty-ninth. On the thirtieth evening I expect to go down the North River to New York, paying some visits on my way, but so as to reach the city two days before the Fourth of July. I beg your pardon for the trouble I give you, but you know better than myself at which of those places the letters from Washington and afterward those from Louisville can best get to my hands, and I am sure you will friendly sympathize in my eagerness to obtain them. I need not observe that letters directed to my son or to Mr. Le Balleur ought to be also returned. As to the trunks or other packages of those kind which cannot be forwarded by mail, I will claim your kindness to have them conveyed to New York and directed to Mr. Whittlock, Jr., at that place. While I ought to apologize I will only thank you for the trouble which you have encouraged me to give you, and of which I confess, I stand in great need, having no other way to return the series of my correspondence, from the other side of the Atlantic. With the highest regard, I have the honor to be, yours

LAFAYETTE.

P. S.—Upon consideration of the difficulties attending other conveyances than the stage, I beg you, my dear sir, to keep at Washington the trunks and other objects too bulky to go by that commodity. I expect to be at the seat of Government about the middle of July.

RECOMMENDATIONS.

Bridle paths.—The superintendent, after long study of the park's opportunities and landscape character, would strongly urge the development, as a leading feature, of a connected system of bridle paths linking the whole park together. For this the opportunity is singularly great, owing to the extraordinary scenic variety of the park within easy riding compass and the wonderful ocean or inland water views exhibited from every eminence and mountain shoulder. Such bridle paths can go where automobile roads could not be constructed, they can be built and kept in repair at a mere fraction of the cost of motor roads, and riding makes possible the detailed observation of interesting wayside features which would pass unnoticed, or scarcely noticed, in the swift speed of motors.

Forestry.—Forestry work on an extended scale is urgently needed in the woodland portions of the park. The native forest, famous in Longfellow's description in "Evangeline," is of great beauty, density, and swiftness of reproduction. If of second growth, as now it mainly is, it quickly chokes itself, when left uncleared, by the dead limbs its density creates and the young trees that have sprung up and died within it. Then if a fire starts in time of dryness and is fanned by some strong wind it will sweep whole tracts, destroying even the seeds of future growth and the important, long-accumulated forest humus. Once cleared, however, such woodlands, like the primeval forest, largely keep

themselves open, and become sources of great delight and recreational value. One further reason exists for giving special care to these woods of the Lafayette National Park—they form the only exhibit in the national-park system of the Appalachian forest, with its mingled evergreen and deciduous trees and its magnificent autumnal coloring.

Maps.—One of the most pressing needs of the park is that of a good survey and map. The old Government survey of Mount Desert Island was made long since and hastily, with numerous inaccuracies. Every visitor to the park desires and needs a map for guidance, and the survey necessary for it could be combined with the geological study of the island already referred to, which is in itself important and would be a feature of great educative interest.

Ranger camps.—Ranger camps at various points in the park are greatly wanted. They would make possible far more efficient protection to the park's wild life, and would be of great usefulness also in regard to visitors. In the winter time they are necessary for the rangers' shelter.

Trails.—The park has an asset of unique value in the old mountain trails trodden for generations by climbers and marked by cairns of stone. There are fully 150 miles of these within the parkland area. They are rough and simple, but they are necessary until better—where desirable—can be prepared, and they sorely need repair and clearer marking.

Well-built foot paths for safe and easy passage to striking points of view or establishing main connections in the park are greatly needed, too, and every year should see their lengths extended. To these the splendid nature of the granite rocks as they rise above the woodland areas and the beauty of the woodlands lend themselves so well that nothing like them, in the few portions yet constructed, exists elsewhere in eastern North America, and but rarely anywhere.

Resort to the park.—It is impossible to render accurate statistics of the park resort, as is done in some of the western parks that furnish within themselves the only opportunity for residence to their visitors or are entered only at a single point. The Lafayette National Park lies in a peopled region on an island that the sea sweeps broadly round, and is devoted—a coastal fishing industry apart—wholly to the entertainment of summer visitors and to the market gardening and dairying necessary to their food supply. Half a dozen resort villages, sprung from early fishing villages, lie about it on the shore, while other resort villages within motoring and boating reach, extending from Winter Harbor upon Frenchman's Bay to Blue Hill, Castine, and Islesborough, lie around it on the mainland or on other islands. The park lies at the scenically culminating point of the whole region and is widely visited, by land and water, from every part of it. Under such circumstances no accurate, statistical account of visitors is possible, but they are very numerous the summer through. The railroad and boat estimates run high into the thousands, and more come by motor now than train. At one time in the season 1,200 automobiles were recorded at Bar Harbor, and there were hundreds more besides upon the island elsewhere. Placed where the park is, and with the beauty and climate that it has to offer, the resort of the future to it will be determined only by the development of its resources.

CASA GRANDE NATIONAL MONUMENT.

FRANK PINKLEY, Custodian, Blackwater, Ariz.

The Casa Grande Ruin Reservation consists of 480 acres of land lying in the south central part of Arizona at an altitude of 1,422 feet, and is a typical spot of desert scenery, being level ground on the floor of the Gila Valley, covered with a growth of mesquite, cresote bush, and salt bush.

The reservation was set aside by Executive order dated June 22, 1892, under the act approved March 2, 1889 (25 Stat., 961). The boundaries of the reservation were changed, without changing the area, by presidential proclamation of December 10, 1909. On August 3, 1918, by presidential proclamation the reservation was made a National Monument under authority of an act of Congress approved June 8, 1906 (34 Stat., 225), and placed under the jurisdiction of the National Park Service which was created by the act of Congress approved August 25, 1916 (39 Stat., 535).

The name "Casa Grande" or "Great House" was first applied to the large central building by Father Kino, who was, so far as we have records to show, the first European person to visit it. While visiting Bac, a settlement of mixed Papago and Sobiapuri Indians on the Santa Cruz River about 12 miles south of the present city of Tucson, in 1692, Father Kino had heard, probably from local Pima Indians who lived near it and who had walked the 90 miles down to Bac to see the white man who wore the black robe, of the remains of a large four-story house standing in the desert near the Gila River. On that trip he was unable to come further north, but carried the descriptions given him in his mind, and on the next trip north from Dolores he followed the Santa Cruz on from Bac past the Tucson and Tortillita Mountains, where, leaving the Santa Cruz, he rounded the Picacho Range and struck straight across the desert twenty odd miles, coming to the Casa Grande.

On his next trip north, in 1697, he was accompanied by Lieut. Juan Mateo Mange, who kept a diary of the trip, in which we obtain the first written description of the ruins.

At this time the Casa Grande stood a burned-out, dismantled group of walls, and so far as the local Pima legends gathered at that and later times give evidence they show that the building had been in the same condition for two centuries before Kino's trip.

One is led to believe that it was an old building when it was abandoned, for while four centuries of erosion has scarcely touched the plastering on the interior the exterior plaster, which was originally as smooth and as hard as the interior plaster now is, has been entirely disintegrated excepting at one place on the east wall of the building. Bits of evidence like this would point to the age of the Casa Grande as being at least 600 to 800 years. This, however, is by no means the age of the village, for the evidence points to the conclusion that the Casa Grande is only the last of an indefinite number of pueblos which have been built in the vicinity. These pueblos were not all contemporary, but some appear to have been abandoned and forgotten long before others were built.

A theoretical scheme of the development of the civilization which flourished and passed in the Gila and Salt River Valleys would call for the migration of the people to the flat valley floor from a mountainous country. Their first settlements would naturally have been located near the river, and the first land to be farmed would be a narrow strip

along the bank of the river, where the water could be led out by the smallest and shortest ditches.

We may suppose that at this time the people were living each family in a separate house and the house was a simple brush structure covered inside and out with a mud plaster. The land next the river being pretty well taken up as their population increased and more land being needed, they would take out a new canal higher up the river and lead it up on higher ground, thus covering the needed new acreage with water. This was done at least twice and possibly a third time before the village at the Casa Grande Ruins was founded. We must remember in this reclamation of new acreage that these ancient inhabitants did not have, as the present inhabitants have had, the eastern States feeding the extra population in to them as fast as it could be absorbed. They waited until their natural increase of population demanded more ground, so that the time elapsed between the building of the various high-line ditches must have been very much longer in their day than it has been with us. The labor involved, too, in taking out a new ditch must have given them pause. Think of the labor expended in loosening the dirt, putting it in baskets, and carrying it away to construct a canal 5 or 6 miles long, which would carry water 12 or 14 feet wide and 3 or 4 feet deep.

These large canals must have evolved, naturally, from the small, single-family ditches. Ten or twelve families would find it easier to join hands and build one large ditch than try to build and maintain many small ditches.

The ditch experience would lead to a similar evolution in house building. The tendency in the intensely hot summers in this low country would be to thicken the walls of the house by plastering on more mud, thus keeping out the sun's heat. To hold the heavier mud walls upright would take a heavier brush construction. This action and reaction increased first one element and then the other until from being a brush wall with a mud plaster it became a mud wall built over upright wooden core rods. The first type had brush core rods about an inch in diameter standing side by side with about an inch of mud plastered on the inside and outside. The final type had vertical juniper core rods 3 or 4 inches in diameter spaced about a foot apart in the center of an 8 to 12 inch wall. This type of wall is shown to visitors in Compound B, which was abandoned about the time Compound A, of which the Casa Grande is one building, was built. The use of this juniper wood for core rods entailed a trip of 60 or 80 miles up into the mountains, for the wood could never have grown near the ruins on the 1,400-foot level in the 33d degree of latitude. As this type of wall must have developed slowly they needed the reinforcing poles only in small lots, and comparatively small gangs could furnish them as needed by walking up the Gila River watershed to the higher levels, cutting the timbers with their stone axes, and floating them down the stream.

The average visitor, when he walks around and examines the 105 rooms which we now have open in the Casa Grande group and is told that this group is only one of 18 villages in the Gila Valley and that there are 24 more villages in the Salt River Valley, is inclined to balk at this explanation of procuring timbers to be used for rafters and reinforcing rods, but there is nothing so startling about it when one considers that the labor was distributed over many generations and over many individuals in each generation, so that no particular person need bring down much timber, nor would any great amount of the whole be required in any one year.

After developing the reinforced type of wall to a thickness of about 10 inches, it must have occurred to some one that the mud wall was thick enough to stand alone and bear the weight of the roof. They experimented with this and soon developed the solid type of wall in which they added a little more mud, which was cheap and easy to obtain, and did away with the juniper reinforcing poles, which were expensive in both time and labor.

In this manner this ancient civilization worked from the reinforced to the solid type of construction for economically sound reasons and for the same reasons, because by adding a few steel rods in our concrete walls we can save time and labor our civilization has reversed these steps of wall evolution.

From the communal experience gained in uniting the work of several families in making one ditch, it might be supposed the leaders would reason that it might be desirable to build a single house large enough to house several families. It would take a much smaller cubic footage of material to build eight or ten rooms in one house than to build the same number of detached rooms. There would also be the advantage of the clustered rooms being easier to defend in case of attack, and the chance that all men would be absent at one time would be small, so they would be better prepared for surprise attack by an enemy force.

That these people were divided into clans there can be scarcely any doubt, and in this clustering of houses families of the same clan would no doubt unite to form a house cluster. Clan House No. 1 of the Casa Grande group is pointed out to visitors as such a possible house cluster.

Study of this house reveals some evidence that it was first an eleven-room plan built in a U shape inclosing three sides of a plaza, the plaza being defended on its fourth side by a wall connecting the extremities of the U. Three more rooms seem to have been added at a later date, and still later a defensive wall has been built around the whole building.

After reaching this clan-house period, the next logical step was for some leader with a wider vision than the rest to propose that by uniting several clan houses in one group they could save labor in one defensive wall around the group as against a separate wall for each house. Defense would also be easier, and social advantages of working and playing together would be greater.

This last unit is called a compound, and of these compounds we have opened part or all of A, B, C, and D, and have located others in the Casa Grande group of ruins.

These steps of evolution in wall and house, as might be supposed, were developed together, acting and reacting on each other. The ideal evolution would be to start with the brush wall, develop the reinforced wall, abandon the brush wall, develop the solid wall, abandon the reinforced wall, develop the solid wall into multiple stories and then into the clan house, develop the clan house into the compound, and abandon the clan house.

In actual evolution they probably never entirely abandoned any type after it was developed. The light, temporary brush house, with or without mud plaster, was in use from the earliest settlement up to the abandonment and final movement from the valley. Upon no other theory can certain detached trash mounds be accounted for.

The reinforced type of wall fell into disuse certainly, but that one was occasionally built is proved by the walls of a house found in the last year in the south plaza of Compound A, probably one of the most recent plazas in the whole Casa Grande group.

Compounds developed before the reinforced wall was abandoned because Compound B has more than 30 rooms of the reinforced type and only three of the solid type of walls.

The second, third, and fourth stories awaited the coming of the solid wall. Compound B consisted entirely of one-story houses. They did, however, get the effect of a two-story house here. Wanting to get up above the desert level they built retaining walls about 9 feet high and filled them with earth, forming terraces, in one case 60 by 90 feet square and the other about half as large. On these terraces they placed a number of houses having the reinforced type of wall.

The multistory house was made possible when the solid wall was developed and must have appeared soon after that time. Nearly half of the rooms of Compound A now opened were two stories high, five were three stories, and one, the center room of the main building, was four stories. Three and four storied buildings were expensive to build, for in both cases the lower story has been wasted by being filled with earth at the time of erection.

The only explanation for this filling of stories which seems at all reasonable is that the builders were afraid the load of the high walls would cause crushing strains at the base and so filled the story to absorb these strains. They were willing to go to all this extra labor to get, first, the three and then the four-story building to use as a watch tower. From its top they could see for 10 or 15 miles in all directions over the valley.

Four different plaza levels occur in Compound B. In laying a new plaza level, all buildings were torn down, new dirt was brought in to build the plaza up to the new level, and a new plan was used in erecting the new houses. This was an immense amount of labor, and the best theory yet assigned for this change of plan is based upon the changes of population of the clans. Members of each clan would be housed together in adjoining rooms, making what we may call a house cluster. In the course of time some clans would grow larger in numbers and others would grow smaller. It might occur that one clan would finally fill their cluster house to overflowing and could not build extensions for lack of room, while another clan might be diminishing in numbers and have vacant rooms. When conditions reached a crisis the buildings in the compound would be torn down and remodeled to suit the changed conditions.

Such doors as are in evidence are comparatively small. This was a defensive measure, as the attacking enemy could not rush the room, but must come in one man at a time, and, owing to the fact that all his weapons needed free arm action, each man was helpless and defenseless as he came through the low door. He was open to the blows of the man on the inside and was unable to return them until he could get inside and stand erect.

Light entered through the doorway, and no windows have yet been discovered, unless the openings in each face of the Casa Grande in the third story were not used by ladders for entrance, but were used solely as windows to light the rooms on that floor.

During the last year no large amount of exploration work could be undertaken. Some test pits were dug and a few experimental trenches were run.

By far the most important work has been that done in the elliptical mounds.

Many of the ancient villages of the Gila and Salt River Valleys have a single mound different from the others in outward appearance and, as the work of the last year has shown, different also in its construction. The type, as its name indicates, is nearly elliptical in shape and the center is depressed to about the elevation of the surrounding desert, while the banks of the mound rise from 3 to 7 feet above that level.

The elliptical mound at the Casa Grande group is about 125 feet from north to south and 80 feet from east to west at the highest points on the tops of the bank. This mound has heretofore been called a reservoir or a well. Our work during the past year has developed the theory that it was an open-air gathering place of the people. It has a floor, not quite elliptical but very nearly so, measuring 81 feet 8 inches on the longer axis and 43 feet 3 inches on the shorter axis. This floor pitches from its edges toward the center, dropping about 15 inches, and at the center of the floor we found a hard green stone about 10 by 14 inches had been embedded in the floor. A side wall pitched upward from the edges of this floor, forming an angle of varying degree, being steep at the sides and sloping at the ends of the floor, where it was probably used as a pathway to come and go from the top of the mound to the floor. The longer axis of the mound lies roughly north, 2 degrees east. The center of the floor is about 3 feet below the general desert level, and originally the top of the sloping walls must have been 9 or 10 feet above the desert level.

This mound would have made an ideal open-air stadium, and I am inclined to think that it was used as a gathering place for the people.

Ceremonial rooms have been found inside the compound walls, but they were so small as to preclude any idea of their use as gathering places of the people. They must have been used by the leaders and ceremonial persons when they were acting as intermediaries between the people and the gods. But the elliptical mound could have been used by several hundred persons at one time, and I think it was so used at least twice each year—once at the planting time, when they would be praying to the gods for plenty of water and a good crop year, and once at the harvest time, when they would be thanking the gods for the crops which they had raised.

Aside from test pits and trenches, some clearing-up work has been done during the year. Brush which had grown up within many of the rooms and compounds since the excavations of 1906, 1907, and 1908 was cut out and burned. Parking grounds for automobiles and picnic grounds have been cleared, and some drainage corrections for rooms and plazas have been made.

During the year the old well, which was dug in 1902 and curbed with lumber, caved in and a new one was dug and curbed with cement. A screen porch and bathroom were added to the custodian's residence, and a number of minor repairs were made on the house.

During the year ending June 30, 1920, a substantial fence should be erected around the reservation, a contour survey should be made, and a general parking scheme planned out.

A library dealing with the archaeology, ethnology, and history of the Southwest has been started, and this will be built up as much as possible during the next year, so that interested visitors may have a chance to make their trip here to the ruins something more than a casual picnic party.

The number of visitors during the year was 3,795, coming in 1,762 automobiles. Nearly every State in the Union was represented. Automobile traffic has grown, as was to be expected with the improvement of road conditions throughout the Southwest.

EL MORRO NATIONAL MONUMENT.

EVON Z. VOGT, Custodian, Ramah, N. Mex.

Tourist travel has been greatly hampered this year by the unusually heavy rains all through this State. The roads, which are never what they should be, owing to the sparse population and the meager income from taxes, were this year almost completely wiped out in places. Bridges were carried away, and for days tourists were stranded on account of mud or missing bridges.

El Morro was not visisted by as many people as last year on that account, but nevertheless a good many parties braved the roads and took their chances on hardships in a frontier and unsettled country. No one has ever visited the monument who has said that he was not repaid for his trouble. The beauty of the surrounding region aside from the historical interest of the old Spanish inscriptions, delights everyone, and many come back to bring friends.

During the past year F. W. Hodge, formerly director of the Institute of Ethnology, in Washington, and now conducting excavations at Hawaiku, near Zuni, N. Mex., for the Museum of the American Indian, visited the monumet with his party. Mr. Hodge is one of the authorities on the monument, having made plaster imprints of the principal inscriptions many years ago. While at the monument he made the remark that the inscriptions, dating as they do as far back as 1606, made this place one of the most valuable historical places in America. Were the monument in Massachusetts, he said, it would be "protected with a gold fence with diamond tips, and there would be thousands of people to see it every day."

Steps are now being taken to provide better protection for the old signatures and messages of the past. It is probable that an iron grating will be placed over each inscription, so that unthinking persons will be unable to inscribe their names alongside of the inscriptions of historical interest. During the past year several vandals put their names so close to one of the 1,600 inscriptions that it was decided that steps must be taken to prevent any approach to marring the old words.

The camp house built for the convenience of visitors was used by a number of parties during the year.

In the near future another attempt will be made to put the water from the spring on the south side of the rock in a more accessible form for the use of the public.

Owing to the heavy rains and the fence built around the 240 acres embracing the monument, the wild flowers and wild grass has made the entire pasture a real oasis of rampant green growth. The custodian has poisoned the prairie dogs which have been destroying some of the grass.

Roads have now been repaired, and the monument may be reached either by the road from Grant, N. Mex., or Gallup, N. Mex.

PETRIFIED FOREST NATIONAL MONUMENT.

WILLIAM NELSON, Custodian, Adamana, Ariz.

The Petrified Forest, set aside as a national monument in 1906 and reduced to its present size in 1911, is located in Apache and Navajo Counties of Arizona and comprises about 25,000 acres of ground more or less covered or studded with fossilized wood, some of which has assumed the most brilliant colors, while some, instead of coloring, exhibits a remarkably well-preserved grain.

These trees belong to a now-extinct specie of cone-bearing trees (*Araucarioxylon arizonicum knowltoni*), were carried by water to their present resting place, and embedded in sedimentary layers that solidified to stratified marls and cross bedded conglomerate sandstone. In this bed, under superimposed layers of more or less solid sandstone, marls, and slate, these in turn covered by an inland sea, the decaying organic matter of the logs was slowly replaced by minute particles of silica deposited out of a presumably alkaline solution, the admixture of certain minerals causing the resulting "stone tree" to assume colors beyond description.

The subsequent upheavals and erosion have brought about the exposure of these logs, which now to a great extent are reduced to sections and fragments. Few logs remain actually in place (a notable example is the Natural Bridge, a petrified log spanning a canyon 45 feet wide); the majority have been undermined by erosion, broken into sections generally 3 to 5 feet long, some of which in turn through surface expansion and contraction have been reduced to fragments that pave the ground with a profusion of agate, chalcedony, jasper, and carnelian.

During the winter rains and snows rendered the already poor roads impassable to anything but a light horse-drawn vehicle. Mr. Frank Pinkley, custodian of Casa Grande National Monument, visited the foest to inspect the roads, and upon his recommendation an allotment of $1,000 was granted. Of this, $955.32 has been expended in building and repairing approximately 5 miles of road within the monument. The road has been relocated generally, the object in view being to keep on high ground, so as to avoid washings, as well as to lead the road in close proximity to the principal points of interest. The once narrow, crooked, and steep cut leading from the First Forest to the surrounding mesa has been nicely graded and supplied with culverts. On the whole, a comfortable auto road has been established, which will need only small attention to keep it in condition.

A further allotment is needed to reestablish the road connecting the Second and Third Forests, after which the road system will be complete.

The Petrified Forests may be seen by visitors almost any day in the year, exceptions due to high water in the Rio Puerco rendering this stream impassable.

Tourists traveling by rail will find at Adamana auto stages making daily trips to the most attractive and interesting points in the forests; a hotel furnishes accommodations.

Auto tourists traveling on the Albuquerque—via Gallup—to coast highway can make a 9-mile side trip to Adamana to the First and Second Forests; while the ones traversing the Albuquerque-Springerville-St. Johns-Holbrook to coast highway will pass through a corner of the Third Forest between St. Johns and Holbrook.

After the "missing link" (the road between the Second and Third Forests) has been supplied, the traveler will be offered a tour of the oldest forest in the world, and the odd and wonderful sights therein will make it a never-to-be-forgotten trip.

MUIR WOODS NATIONAL MONUMENT.

ANDREW LIND, Custodian, Sausalito, Calif.

During the past season the Muir Woods National Monument has been improved by the graveling of the automobile road that traverses it. This road is now in very good condition and has been used extensively by automobiles during the past season.

Five thousand and forty feet of water pipe were laid and 10 hydrants installed in order to afford better facilities for the visitors to the park in obtaining water for drinking purposes.

All trails have been cleared of brush and otherwise repaired and all fallen trees and branches have been cleared away.

The wild animals in the park include deer, coons, grey squirrels, foxes, and coyotes. During the summer months there are a number of blue jays in the park and also many wild canaries.

During the past season approximately 42,200 visitors entered the Muir Woods National Monument; 15,600 came by train, 1,600 by private automobile, and 25,000 made the visit on foot.

TUMACACORI NATIONAL MONUMENT.

FRANK PINKLEY, Custodian, Blackwater, Ariz.

The Tumacacori National Monument was created by proclamation dated September 15, 1908 (35 Stat., 2205), to protect the ruins of the Tumacacori Mission. The monument contains an area of 10 acres. The ruins of this mission are well worth preserving, as they are of more than local or State interest in that they represent one of the units of the first line of settlements pushed into the United States west of the Rio Grande.

They should not be studied separately, but as a member of a chain of missions consisting of San Gabriel de Guevavi, San Cayetano de Calabasas, St. Gertrude de Tubac, San Jose de Tumacacori, and San Xavier del Bac.

I consider the walls now standing at the site of the Guevavi Mission as the oldest mission walls now standing in Arizona. They date from about 1730, and are possibly a few years older than that. The other mission walls have either been built or rebuilt at a later period.

The name Guevavi is from the Papago language and means large well. Tumacacori means place of many small fields. Bac is a species of grass which grows in low marshy ground. These places probably bore these names long before the missions were founded. They are located along the Santa Cruz River, which for generations before the arrival of Europeans must have been used as a thoroughfare for all north and south travel from the Gila River into the northern part of Mexico.

The mission at Guevavi is in ruins and can not be restored. Parts of the church wall are still standing, and the walls of the outer buildings can still be traced on the ground. It is to be hoped that the State, county, or near-by town can be roused to the point of spending a few hundred dollars in underpinning and protecting the present standing walls, but it would be useless to try to restore it to its original state.

The mission at San Xavier, about 12 miles south of Tucson, is in an excellent state of preservation, is under the charge of and is now being used by the Catholic Church.

The Tumacacori Mission, in earlier times called San Cayetano de Tumacacori and in later times San Jose de Tumacacori, is located 49 miles south of Tucson and a little more than 18 miles north of Nogales, in southern Arizona.

The site of the mission was first visited by Padre Kino in 1691.

Father Eusebio Francisco Kino, S. J., the pioneer missionary in this county, was born about 1646. He came to Mexico from the Old World in 1681 and stopped in Mexico City until 1686. He then went north and established his first mission, that of Nuestra Senora Dolores, on March 13, 1687. From this headquarters, between 1687 and the time of his death in 1711, he made many trips into the valley of the Santa Cruz River.

Leaving Dolores in 1691, Father Juan Maria Salvatierra and Father Kino traveled by way of Santa Maria Magdalena Pueblo and a land called El Tupe, to the mission of San Pedro y San Pablo de Tubatama on the Altar River. Thence they went to Saric and Tucubabia in the same vicinity. Here they were met by a delegation of Sobaipuris, from the region about the present Tumacacori Mission. The Indians asked the fathers to visit them, and, according to Ortega, they did so, going by way of Guevavi to Tumacacori, thence back to Santa Maria de Suamca, and thence to Cocospera.

There is, as yet, no evidence that missions were founded at either Guevavi or Tumacacori on this first visit, but Father Kino passed this way again in 1692, 1694, 1696, 1697, and 1699, and it is reasonable to suppose he talked and preached to the Indians, preparing the way for the resident priests who came later.

Engelhardt says that only two or three Jesuits are known to have worked in the field near the Arizona border before 1730. In 1731 a small reinforcement of Jesuits came in, two of whom were sent to the north and effected what may be regarded as the first Spanish settlement in Arizona. Father Felipe Segesser took charge of San Xavier and Father Juan Baptista Grasshoffer of San Miguel de Guevavi, which from this time may be regarded as regular missions, the other rancherias, among which was Tumacacori, becoming visitas, or missionary stations.

At this time, or soon after, a building must have been erected at Tumacacori, although we have no notice of it until we learn that it was attacked by Apaches in 1769 and was almost in ruins in 1772. It was repaired by 1784, and Bancroft says it had become a mission instead of a visita by 1784 or earlier. This first building, which was reroofed in 1791, may have been destroyed in one of the Indian raids subsequent to 1806.

The present church was under construction in 1822, but work was being held up by a delay over the payment for some cattle which were being sold to raise funds, and a study of the walls will convince one that the building was never entirely completed. Fray Narcisso Gutierrez was the minister from 1814 to 1820; Juan B. Estelric, 1821 and 1822; and Ramon Liberos from 1822 to 1824.

Father Liberos made an entry in the burial record of the mission to the effect that on December 13, 1822, he had removed the bodies of Father Carrilio and Father Gutierrez from the old church to the new and buried them on the gospel side of the altar. From this evidence it is reasonable to assume that the present church was under construction at the death of Father Gutierrez in 1820 and was not yet in use, but by the latter part of 1822 services were being held in it and, the old church being abandoned, the bodies were removed to the new. On the evidence as it stands, we cannot assume the present mission walls at Tumacacori to date earlier than 1800.

Tumacacori Mission must have been abandoned soon after 1824. Prof. Thomas Davies, superintendent of the Aztec Syndicate Mines, wrote that when he first passed down the Santa Cruz Valley in 1849 the church roof was nearly intact and much of the interior was in a good state of preservation. There were many fruit trees, pomegranates, peaches, etc., bearing profusely, and the walls that once inclosed the orchard and garden could still be traced by the eye.

In the last report, dated 1860, made to the mining organization of which he was general agent, Prof. W. Wrightson thus describes the Tumacacori Mission:

"The church is an adobe building plastered with cement and coped with burnt brick. The front is of the Moorish style, and had on the southeast corner a tower, the top of which was burnt brick. The roof of the church was flat and was covered with cement and tiles. The timbers have now fallen and decayed. The chancel was surmounted with a dome, which is still in good preservation. Adjacent to the church, in the form of a hollow square, were the residences of the priests, containing spacious and airy rooms, with every evidence of comfort and refinement, while surrounding these in the interior was an arched colonnade forming a shady walk around the whole inclosure. To the east of this square of sumptuous residences was an oblong building, where the metallurgical operations were carried on. Here are still the remains of furnaces and quantities of slag, attesting the purposes for which this was formerly used; and further still to the east was the garden, inclosing about 5 acres and surrounded by a cahone wall. The acequia passed through this, and here are the remains of a bathing place and washing vat. There are also fruit trees and vines still growing; while in the rear of the church is the campus santi, a burial ground surrounded by a strong adobe wall, well covered with cement and forming even now the best inclosure in Arizona. To the south of the mission building and fronting the church was laid out a large square or plaza, which was surrounded by peon houses, thus forming a respectable village."

In describing the Tumacacori Mission and surrounding mounds and traces of buildings we will divide them into the church building, which will include the baptistry and sacristy; the cemetery and mortuary chamber; the outer buildings and inclosures; and miscellaneous structures.

THE CHURCH BUILDING.

The church building is built for the greater part of sun-dried adobe bricks laid in mud mortar. The walls average about 6 feet thick at the base and are stepped back so they are about 2½ to 3 feet thick at the top. In places where great weight was to be carried, as in the tower, the walls are nearly 10 feet thick. Where exposure to the weather was liable to occur, burned-adobe bricks were substituted for the sun-dried bricks. Burned bricks were used in capping walls and in constructing the bell tower.

The church building lies northerly and southerly, with a width in front, including the tower, of about 52 feet, and a length, on the west side, of about 104 feet. It has three essential divisions—the church room proper, the sacristry, which is attached to the church on the east side at the north end, and the tower, which is attached to the east side at the south end. The tower was apparently considered as a separate unit in designing the façade, as the decoration of the front of the church was not carried across its base.

Approaching from the south the visitor will notice that the façade is in bad condition. As it was originally designated the façade had a two-story effect, the upper story being surmounted by a semicircular pediment. The first story was marked by four columns placed in pairs, the arched entrance being between the pairs. Well up between the columns niches were placed for the reception of statues. These columns were attached to the wall for their full height and bore on their capitals an attached lintel running across the face of the church. Mounted on this lintel four other attached columns were placed, forming the second-story effect. Two of these were on either side of the choir-loft window, and between each pair of these columns was another niche for the reception of a statue. These upper columns supported another attached lintel. The façade at present is broken off just above this lintel, but when completed the wall ended in a semicircular pediment, and rising into this pediment from the ends of the upper lintel ran a cornice having a gable effect. The two slopes of this cornice did not meet, but left an open space on the wall about 4 feet wide, and standing in this space and resting on the upper lintel was a statue, probably of the patron saint, St. Joseph. The facade of the San Xavier church has the figure of St. Xavier at its top.

The whole façade was surrounded near its edge by a heavy molding projecting about 6 inches from the face of the wall. At the top of the pediment was a half sphere, and mounted on it was a cross. Aside from decoration by columns, lintels, molding, and statues, the façade was further decorated by painting, traces of which still exist in protected spots where the erosion has been least.

The arched entrance was in bad condition, the sides and the greater part of the arch having fallen. This has been restored during the past year and is now the original size and is bearing its part of the weight of the wall above. The entrance was 6 feet wide and 9 feet, 6 inches high. This opening was originally closed by swinging doors about 10 feet high and 4 feet wide set just behind the arch. The doors were pivoted at the top in a wooden lintel sunk in the wall behind the top of the arch, and at the bottom excavation disclosed socket stones at each side, which probably carried wooden or metal sockets upon which the bottom pivots of the doors rested. These doors have been restored, using the same heavy construction and same heavy design as the original.

The church room was about 17 feet wide and 89 feet 6 inches long in its inside measurements. It has three well-marked sections—the vestibule, the nave, and the sanctuary.

Upon passing through the entrance the visitor is in the vestibule or space under the choir loft. The loft was supported on its east, south, and west sides by the walls of the church, and its front, or north side, was carried on an arch. The choir loft and arch

were broken down and covered the floor with their débris to a depth of between 3 and 4 feet. This has been removed in the repair and restoration work of the last year. A doorway, or arched tunnel, leads from this vestibule through the east wall, at this point nearly 10 feet thick, into the baptistry in the base of the tower.

The nearness of the choir loft over one's head, it being about 10 feet high, would have emphasized the height of the church in the nave and sanctuary and made the walls there seem higher than they really were.

The fonts for the holy water occur at the San Xavier Mission on the vestibule side of the piers which carry the choir loft, but here at the Tumacacori Mission they are placed slightly forward of the piers on the nave side.

It will readily be seen from an examination of the interior plan of the church that it could not have been the intention of the designers to seat a congregation in this building. The idea seems rather to have been to overawe and impress the primitive mind, and this could be done with better effect without the use of seats.

Excavations made during the last year have cleared up the floor plan of the church and discovered six altars in the nave.

The view forward as one entered the nave must have been rather impressive. The wall of the nave was divided by two piers centrally placed. These piers were treated as altars, and the elevation of one of them as it was originally designed is shown in the accompanying plans and elevations. The base, resting on the brick floor of the church, is 8 inches high, 4 feet 10 inches long, and projects from the wall 2 feet 11 inches. The pier, which is 3 feet 5 inches wide and extends from the wall about 16 inches, rises from this base. From the top of the base to the neck mold, where the piers end at present, is just 22 feet, or, with the 8-inch base, it is 22 feet 8 inches from the brick floor of the church to the neck mold, which began the decoration of the cornice. I have yet to determine the height of the cornice, but it must have been nearly 2 feet, which would have made the nave approximately 25 feet high from the floor to the roof beams. For some time I thought these piers had carried an arch and the nave had been covered with a barrel-vaulted roof supported by this arch. Excavation, however, did not disclose enough bricks for this type of roof, and it is now decided to have been a flat roof supported on wooden beams.

The pier at its base contained a niche for a statue. This niche had a recessed base 1 foot 6 inches high set back about 2½ inches from the base of the pier. The niche proper, from this base to its top, was 4 feet 9 inches high. Above the niche, at a distance of 1 foot 5 inches, a medallion was attached to the face of the pier. This medallion was oval or elliptical in shape and measured

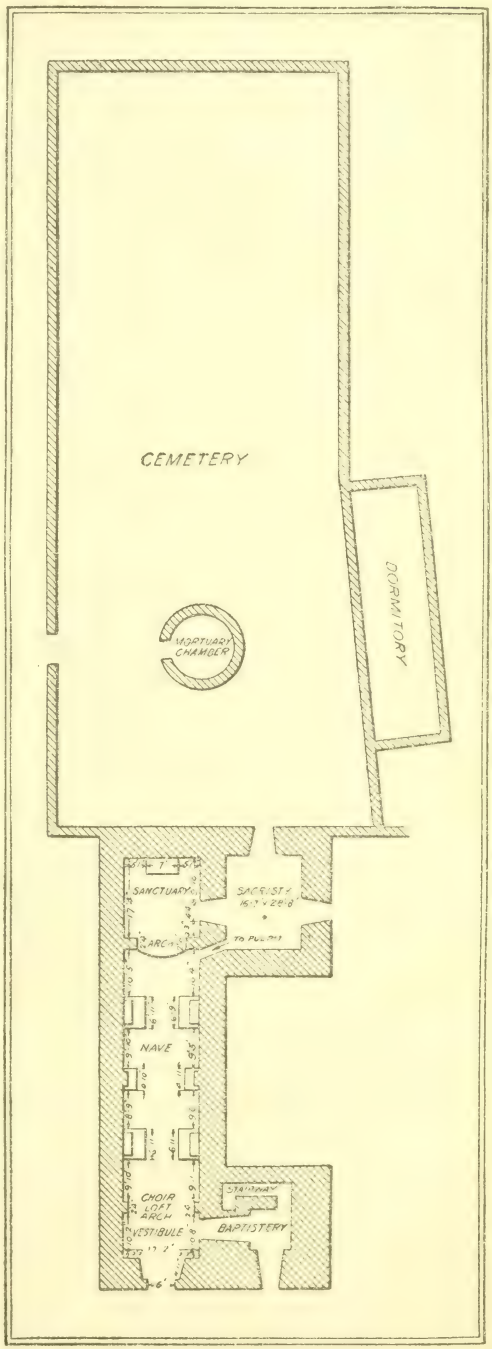


FIG. 4.—Plan of Tumacacori Mission, Tumacacori National Monument.

1 foot 5 inches on its longer or vertical axis. I think there may have been 14 of these medallions attached to the walls of the nave and vestibule. If this should prove to be the number, I should then think they were the stations of the cross used in the Catholic ritual. They are all broken away now, and so far only a few fragments of them have been recovered, not enough to show any painting or sculpture.

At a distance of 2 feet above the top of this medallion a corbel began which was 2 feet 4 inches high to its top and formed the base of a niche which was 5 feet 3 inches high. From the top of this niche it was 3 feet 4 inches to the neck molding.

Each wall of the nave was divided by one of these piers into two nearly equal sections. Nearly at the center line of each of the four sections thus formed, and just under the neck molding, was a window about 6 feet 6 inches high and 4 feet 6 inches wide. These four windows, with the choir-loft window over the entrance, admitted all the light the nave received during the day.

Under each of these four windows was a large altar, of which an elevation is given showing it as it was originally designed. Like the smaller altars of the piers, the base rose above the floor of the church 8 inches. This base was 6 feet 11 inches long and extended from the wall of the church 4 feet 10 inches. On this base rested the body of the altar, which was 5 feet 10 inches long, 2 feet high, and extended from the wall

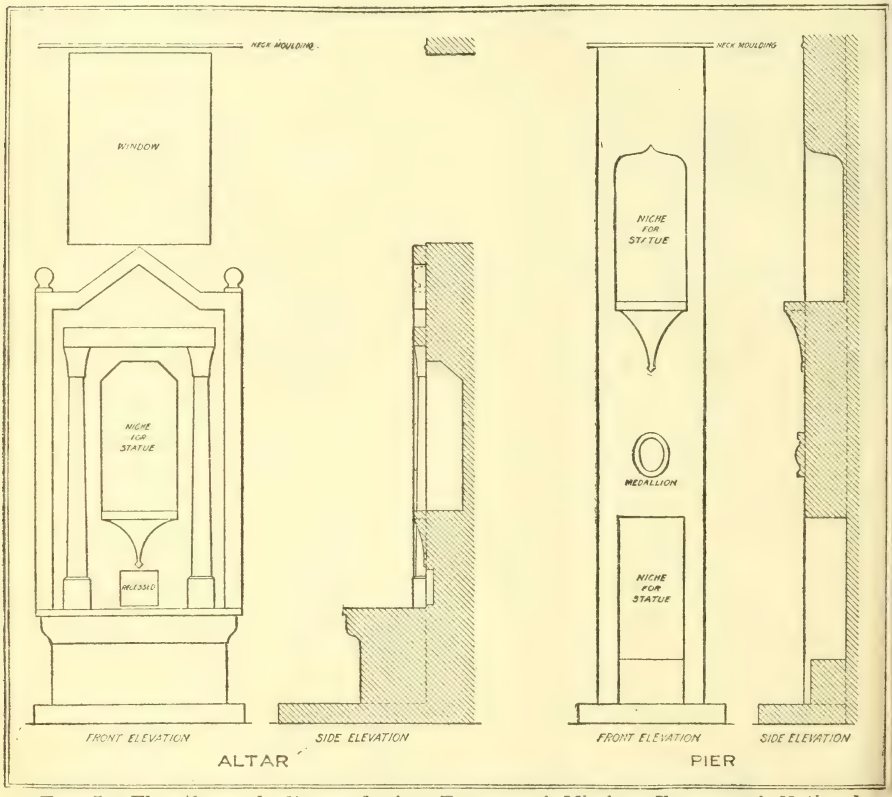


FIG. 5.—Elevations of altar and pier, Tumacacori Mission, Tumacacori National Monument.

2 feet 2 inches. This body was surmounted by a cornice of burned brick made in a special mold, which was about 14 inches high. Here, at a distance of 3 feet 10 inches above the floor of the church, was the top of the altar proper. Above this altar was a niche for a statue. This niche measures 2 feet 6 inches wide by 5 feet high and had a corbel attached to the wall at its bottom. Around this niche ran two decorative designs. The inner was in the form of attached columns, one on each side of the niche, bearing on their capitals an attached lintel. The outer decoration was a molding bearing a gable effect at its top, which reached to the opening of the window. This molding bore at each of its upper corners an extension somewhat in the form of a knob.

The idea of putting the windows just above each of these four large altars was not only to complete the symmetry of the wall sections, but also to have the light from the opposite window strike strongest on the statue in the niche and bring it out of the semi-darkness of the nave.

Dividing the nave from the sanctuary, we have a beautiful arch, still in good condition, which supports the front of the dome over the sanctuary. This dome and the cupola which surmounts it are in excellent condition. Two rows of bricks have been left projecting from the dome forming steps up to the cupola. They were probably intended to be used when repairs were necessary to this part of the edifice.

The floor of the sanctuary was raised about 3 feet above the floor of the nave, and being an earth fill, the material was held by a circular wall springing from the piers which carried the sanctuary arch, the circle projecting about 2 feet at its greatest distance from a chord connecting the corners of the piers on that side nearest the nave. A series of steps, centrally located, led up from the floor of the nave to the floor of the sanctuary.

The whole back wall of the sanctuary was filled with the high altar and its subsidiary decorations and statues. The lighting here was by side windows placed higher in the walls than the windows of the nave, the sanctuary walls being several feet higher than the walls of the nave.

The pulpit was placed on the east side of the nave just in front of the pier which carried the sanctuary arch. It was entered from the sacristy by a series of steps leading up through the wall.

High up on the walls of the sanctuary the marks are still visible where twelve paintings have been glued to the walls. These were probably portraits of the twelve apostles. The dome over the sanctuary was decorated with painted conventional designs, and the four corbels springing from the corners and, supporting the dome, bore symbolic paintings.

An arched doorway leads through the east wall of the sanctuary into the sacristy. This was a fairly large room, about 17 by 20 feet inside. In addition to the door entering from the sanctuary, it had a window in the north wall, which looked into the cemetery, a door through the east wall, and the passage above mentioned in the west wall, by which the priest entered the pulpit. This room is covered by a barrel-vaulted roof supported midway by an arch which springs from the east and west walls. Poor designing is shown here in that both ends of this supporting arch spring from the walls directly over arched doorways. The walls of the sacristy seem not to have been decorated, and no evidence has so far been found of the location of the cupboards and closets where the robes and altar articles were stored.

The tower was designed to be three stories high. The first story was the baptistry, the second was probably a robing room for the use of the choir, and the third was the bell tower. Stairways were built in the walls.

The baptistry was a rather small room lighted only by the window on the south. It was roofed by a perfect little domed ceiling, nicely plastered but showing no decoration. In the east wall was a recess, probably closed by doors and used as a storage place for the robes and articles of baptism.

At the east end of the north wall was a low doorway, where one entered the stairway. The stairs rose a few steps to the north and turned upon a landing to the west in the north wall. They turned again in the northwest corner of the tower and reached a landing on the second floor near the center of the west side. Here a door opened westward into the choir loft and one opened eastward into the supposed robing room. This room was nearly the size of the baptistry on the first floor. No lighting was provided in the walls of this story except a V-shaped slit placed in the east wall and arranged with the apex of the V pointing outward. Local tales have it that this slit overlooks the mine across the river in the mountains where the fathers acquired their fabulous riches.

After passing the two doors on the landing the stairs rose again, turning in the southwest corner of the tower end, in the middle of the south side, and came up to a landing on the third floor at the south arch of the bell tower.

The bell tower is constructed of burned brick used for an outer shell, backed or filled with a mixture of adobe or large bowlders. The bell arches are about 5 feet wide, 5 feet thick, and 10 feet high. The four faces of the tower were similar. Centrally located in each face was the great bell arch with its beam of mesquite wood near the top, from which the bell was hung. The face of this arch at the top projected several inches in the form of a molding made of specially cast bricks. Framing the arch at a distance of a foot or more ran another molding made of a different type of specially cast brick. At the outer angles of the tower another molding was carried up within an inch or two of the corner. Centrally located between the frame of the arch and the molding at the corner in the outer face of each pier of the bell tower was a niche for a statue. These niches had brick corbels built in at their base, and their tops are beautifully worked out in a shell design with a fine grade of plaster, the only finishing plaster on the whole bell tower. There were eight of these niches in the bell tower and four in the façade, making it a possibility that there was one for each of the statues of the 12 apostles.

Undoubtedly the intention was to complete the bell tower with a cornice surmounted by a dome with a cross over all. Corbels for a dome show within the tower.

The outside of the building was plastered with an excellent grade of lime plaster which was burned in the vicinity. This plaster was laid on in two coats, and on the sides and back of the building the last coat was decorated with spots of broken slag and brick crushed to about the size of grains of corn. About half a handful of this material was embedded in the unhardened plaster at regular intervals, and the black and red coloring makes an interesting decoration on the white lime of the wall.

Drainage from the roof was handled by means of 14 down-spouts molded against the walls. These were not tubes, but were simply shallow valleys molded of lime against the wall and projecting an inch or two more at the bottom than at the top. This slight angle caused the water to follow the valley in its downward course instead of dropping clear or overrunning and wetting the wall. This same type of down spout was used at the San Xavier Mission, and one is surprised that, after being so successful on these buildings, the method has not come into general use among the architects and builders of the present day.

CEMETERY AND MORTUARY CHAMBER.

The cemetery lies just back of the church and is about 176 feet long and 61 feet wide. It was surrounded on the west, north, and part of the east sides by a wall about 2 feet thick and 8 feet high. Part of the east and the greater part of the south sides were taken up by buildings, the latter being the rear of the church.

The cemetery wall is in a fair state of preservation except a stretch of about 50 feet on the west side and 30 on the east side, which had fallen and had to be rebuilt in the repair work of the last year. The wall was built of unburned adobe bricks, covered inside and outside with two coats of lime plaster. The outside was decorated with the fragments of slag and brick in the manner above described. The wall was capped with a row of unburned brick, which were intended to withstand the erosion. The inside of the wall

had large niches at regular intervals, which no doubt held the stations of the cross. There are a number of graves in the cemetery, but only one seems to be of any great age. The local population considers the ground especially sacred and has made numerous burials there in the last few generations.

The main feature of the cemetery is the mortuary chamber. This building measures about 16 feet in diameter inside the walls, was circular, and had a door opening to the west. The roof is entirely gone. The plastering on the inside is in fair condition, but the outside is badly eroded. The outside plaster of this wall was decorated by embedding small fragments of brick in it while it was still soft. It is possible this building was built first, and after experimenting and making a success of the red brick fragments here they went further in the later walls, adding the slag and putting the decoration on in lines.

Entrance from outside the cemetery was gained to the mortuary chamber by means of a gate in the west wall of the cemetery. Assuming the existence of this gate, we made careful excavations for it in the débris directly in front of the mortuary chamber and found the threshold and base of the moldings of the brick frame. The cemetery wall has been restored, the gateway has been rebuilt, and gates have been hung to close the opening.

OUTLYING BUILDINGS.

There were numerous outer buildings around the Tumacacori Mission, but, the walls being thinner and probably not so well plastered as the church building, they have suffered more from erosion and are now for the greater part down in the mounds.

A two-story dormitory building lies just east of the cemetery, the west wall of the house acting for its length as the east wall of the cemetery. There is quite an angle between the axes of the two structures, and the explanation probably is that the dormitory was built first, and when the cemetery was laid out behind it its wall was used for a closing wall for the cemetery regardless of its being slightly out of line. The dormitory walls still stand nearly the full two stories, but the upper floor and roof are gone. There were two large rooms on the ground floor, and a rather pretentious flight of steps led up from a large door in the middle of the east wall to the floor above.

Running east from the north end of the dormitory was a row of rooms now down in a mound. Another row of rooms ran east from the southeast corner of the church tower, roughly paralleling this row to the east from the dormitory, and I think these were the north and south sides of a quadrangle, of which the church formed the west, and a wall, with a gateway leading down into the orchard and garden, formed the east sides. This quadrangle forms the "residences of the priests, containing spacious and airy rooms, with every evidence of comfort and refinement," mentioned by Mr. Wrightson, though some doubt may reasonably be felt about the evidences of comfort and refinement which would be visible in rooms raided and destroyed by Apache Indians and then exposed to 30 odd years' of erosion before he saw them. The oblong room on the east side of this quadrangle mentioned by Mr. Wrightson as the building where metallurgical operations were carried on has not yet been identified. The mound of débris does not indicate more than a wall on the east side of this quadrangle, although excavation might develop rooms.

The plaza mentioned as being to the south of the church is well marked on its western side by a mound of débris joining the church at its southwest corner and running southward. The south and east sides of this plaza are not so well marked, but may have been houses of more temporary character, which would not leave so much evidence.

West of the church are a number of small heaps of débris, probably the ruins of one-room houses erected by the neophytes, forming a clustered village like that which still exists around the San Xavier Mission.

OUTLYING STRUCTURES.

A pit used for burning lime has been found about 100 yards north of the church. It was a cylindrical pit some 7 or 8 feet in diameter and about 8 feet deep lined with adobe bricks, which have been burned quite hard in the process of burning the lime. Excavations made on this site disclosed charcoal at the base of the pit, with partially burned limestone above and quite a lot of rejected material lying about the pit.

Another large pit occurs inside the cemetery wall toward the north end of the burial plot. It is possible that this is another lime kiln used before the site of the cemetery was chosen and abandoned when it was decided to inclose this ground with the cemetery wall, or it might have been used as a bell pit in which to cast the bells for the mission.

A low mound, thickly covered with mesquite brush, was found about 200 yards south of the present church, and the size, amount of material, presence of burned brick, etc., caused us to think for a time it was the site of the older church, but excavation proved it to be the kiln where the bricks were burned for the present church.

All efforts to locate the older church in the vicinity of the present building have so far proved unavailing. These negative results are not to be taken as evidence that the site of the old church will not be found, however, for the ground in the vicinity has not been entirely covered yet.

The walls surrounding the orchard, garden, and field can still be readily traced; stretches of them still stand, and their location is shown in the gaps by the line of bowlders which formed their foundation.

NATIONAL PARK SERVICE ACTIVITIES AT THE TUMACACORI NATIONAL MONUMENT FOR THE PAST YEAR.

On December 9, 1918, the Tumacacori National Monument was formally placed under my direct supervision. Acting under instructions dated September 10, supplemented by instructions of December 3, I made my first trip of inspection to the Tumacacori Mission between December 12 and December 14, 1918. I reported under date of December 17, giving the details of the trip and need of repairs, asking for an allotment of $400 for immediate work.

Acting under instructions contained in a telegram from the director while at the Grand Canyon and also under instructions in a letter of December 27, I met Mr. Herbert W. Gleason and Mr. Charles Punchard, jr., landscape engineer of the National Park Service, in Phoenix, January 3, 1919, and accompanied them to the Casa Grande and Tumacacori National Monuments on a trip of inspection. I reported concerning this trip under date of January 11 both as to the general trip and as to a conference had at the

mission with the secretary of the chamber of commerce of Nogales, and Mr. A. S. Noon, a contractor, in regard to the work to be done.

On February 20 the director wired me that $400 was allotted for immediate repairs, and, after some unavoidable delay, work was started on March 14, with Mr. A. S. Noon as foreman. Work was continued from the 14th to the 22d, inclusive, and from the 27th to the 30th, inclusive.

The total expense of these first operations was $400.45.

On March 12 I asked for authority to visit the mission and was granted it by wire on the 13th. I was out on this trip from March 17 to March 20, inclusive. It was while on this trip that I talked with the people of Tucson and Nogales, and a plan was worked out for further repairs by which our Service was to allot an additional $200 and the chambers of commerce of Tucson and Nogales would each allot $200, the $600 to be spent under my direction.

I visited the monument again from April 23 to April 26, inclusive, and checked up the work which was going on under the above fund.

A meeting of the Arizona Archæological and Historical Society was held in the form of an outing at the mission May 3 and 4, and I went down to be present at the meeting on behalf of the Service. I was on this trip from May 2 to May 5, inclusive. About 40 members of the society attended the meeting.

The next visit was from June 25 to June 28, inclusive. This was to check up the year's work and close up some financial matters before the year expired. I reported under date of July 6 on this visit.

In addition to the above-mentioned funds, Prof. Byron S. Cummings expended $54 of the State of Arizona funds under his authority as professor of archaeology in the University of the State of Arizona.

The total expenditures at Tumacacori Mission during the year have been $1,051.98. The administrative expense of the year's work has been confined entirely to my expense vouchers, no salary or other expense being charged against the Tumacacori National Monument. The estimated distance I have traveled in these operations is 1,890 miles, and the cost of the various trips was about 11 cents per mile. The total administrative expense was $205.26.

REPAIRS ACCOMPLISHED.

Those repairs which were absolutely needed to prevent destruction of the mission building have been made during the past year. We were limited in general in our fight against the elements to those points of repair where a very little more material breaking away would cause tons of sound wall material to fall. For this reason we put several wagonloads of cement under the southwest corner of the bell tower, where the whole southwest pier was threatening to fall. We also put several wagonloads of cement and stones in the east wall of the sacristy, where there was practically no support for the whole east side of the barrel-vaulted brick roof. Along this line we also underpinned 30 or 40 feet of the west wall of the cemetery, which was in great danger of falling, and underpinned the whole east side of the church, where the adobe wall had badly ground-sapped.

Another class of protection was against vandals. Under this class may be placed the reconstruction of 80 or 90 feet of cemetery wall about 8 feet high and 2 feet thick, the restoration of cemetery gates and some of the doors and windows of the church building.

Other work was a matter of development, such as the removal of débris from the floor of the church and exposing the original plan, thus discovering the altars of the nave, which were not known to exist prior to our work.

The work has progressed well and the money has been well expended.

NEEDS FOR YEAR ENDING JUNE 30, 1920.

The crying need for the present fiscal year is a roof for the nave of the church. This is estimated to cost about $1,200 or $1,300 and must be put on at the earliest possible moment. Two or three hundred dollars could also be used with excellent results in restoring more of the doors and doorways, windows and frames, the stairway in the tower, etc.

I should recommend an allotment of $1,500 for the fiscal year ending June 30, 1920.

NEEDS FOR THE YEAR ENDING JUNE 30, 1921.

Assuming that we spend $1,500 during the present fiscal year, our needs will not be so pressing during the year ending June 30, 1921. We could use $800 to $1,000 to advantage that year, doing outside repair work, restoring plaster, cleaning up debris, and grading up the grounds.

A well should be provided during that year, as the present water supply is too or three hundred yards away on private property, and sooner or later we will have to provide our own supply. It need not be expensive, and I would not estimate it to cost over $50.

IN CONCLUSION.

This report would not be complete without an expression of the appreciation for the aid given the National Park Service by persons and organizations during the past year in connection with our work at the Tumacacori National Monument.

Mr. Bracey Curtis, president, and Mr. J. B. Bristol and Mr. Gil Rankin, secretaries of the chamber of commerce of Nogales, Ariz., were willing and anxious to help us at any time. Judge W. A. O'Connor, as chairman of the Nogales committee, assisted by Hon. Frank J. Duffy and Dr. A. L. Gustetter, had charge of raising the fund contributed by the chamber of commerce.

In Tucson Mr. F. W. Taylor, president, and Mr. Malcom Frazier, secretary of the chamber of commerce, handled the matter of the appropriation made by their organization. Mr. Taylor has also shown a very keen personal interest in our work and has been very helpful in many ways.

Mr. H. O. Jaastad, a prominent architect, has given freely of his time and has been consulted on many points dealing with the architecture of the mission.

Prof. Byron S. Cummings, dean of the College of Arts and Sciences of the University of Arizona, has made several trips to the mission and has been consulted in connection with all our work there.

The Right Rev. Bishop Cranjon, of Tucson, and Rev. Father Nicholas Perschl, who has charge of the San Xavier Mission, have helped us greatly with their wide knowledge of church and mission architecture and history.

Many others in both Tucson and Nogales have been kind and helpful, and both towns have responded with a community interest which is most welcome to our Service.

Last, but not least, we should thank the press, for without the aid of the Tucson and Nogales papers, which have given publicity to our work, we could not have gone so far in the short time which has elapsed since we began active operations.

ZION NATIONAL MONUMENT.

WALTER RUESCH, Custodian, Springdale, Utah.

Steady progress is the keynote in the monument. With the closing of the World War travel has increased fully 300 per cent, the number of visitors up to and including October 12, 1919, being 1,814. Because of conditions brought about by the influenza epidemic, travel was practically suspended during the winter just past. Railroad travel is now being encouraged, the Railroad Administration playing a large part by extensive advertising and the issuance of illustrative booklets on all members of the national park and monument system.

Lund, Utah, is the nearest railroad station, which is 100 miles distant from the Wylie Camp. This distance is covered in eight hours by the National Park Transportation & Camping Co.'s auto stages.

The road through the monument has been maintained and repaired during the past year at a cost of $700, making it a pleasure to travel over it, and comparing very favorably with the best of earth roads. The State has assured us that the road leading to the monument will be placed in good condition, making it possible to travel at any time of the year. This is another step toward making the Zion National Monument an all-the-year-round resort. Already the steep grade, known as the Laverkin Hill, has been eliminated with a good grade at a cost of $10,000, and work has commenced on the much-needed bridges leading to the monument. This, of course, is going to make the roads much more accessible.

The trail to the eastern rim has, during the season just passed, been reconstructed at a cost of $700. This trail adds greatly to the visitors' stay in the manument, because an ascent to the rim assures the visitor a wonderful view of the canyon with its massive walls and side canyons and their brilliant coloring, frequent comparison being made with Yosemite National Park as to these walls.

Another interesting and delightful trip is the one-day horseback ride from the Wylie Camp to the ancient cliff-dweller ruin up the south fork of the Virgin River, six rooms making up the group.

The Wylie Camps have enjoyed a very successful season and with the proper road conditions the next season promises to tax the camps to their utmost.

The climate of this locality in summer is rather warm, but the evenings and mornings are delightful. The quiet, restful atmosphere is making this a haven for people that are afflicted with nervous troubles or those seeking recuperation.

The exclusion of stock from the floor of the valley has caused the restoration of thousands of small trees along the river banks, the underbrush and foliage throughout the entire canyon, also the wild flowers, which thrived especially during the months of May and June, adding considerably to the valley's beauty. Ferns and mosses are also in evidence.

Since the exclusion of the use of firearms from the reservation, the wild game is on the increase, particularly the deer, which are frequently seen on both the eastern and western rims. On the western rim blue grouse are found in abundance. The rodent animals within the valley are becoming very numerous and are taking the liberty of visiting camps while the parties are away.

CAPULIN MOUNTAIN NATIONAL MONUMENT.

Mrs. W. H. JACK, Custodian, Folsom, N. Mex.

Not as many tourists as usual, although more than 1,500, visited Capulin National Monument this year, but there is more local interest. The people of Dedman are quite enthusiastic over good roads to Capulin and are ambitious to have a road built to the top of the mountain, but I do not know that any definite steps have been taken further than to create interest by some newspaper articles printed in local papers; but that is a beginning.

The Ocean-to-Ocean Highway passes through Dedman, about 3 miles from Capulin, but has not been in good repair this year.

The Gulf-to-Colorado Highway passes through both Des Moines and Folsom, and the nearest point on this road to Capulin is about 2 miles. There is another road between Dedman and Folsom that passes just at the foot of the mountain. All these roads can be used by automobiles, so if the roads are kept in good condition Capulin is accessible from all directions.

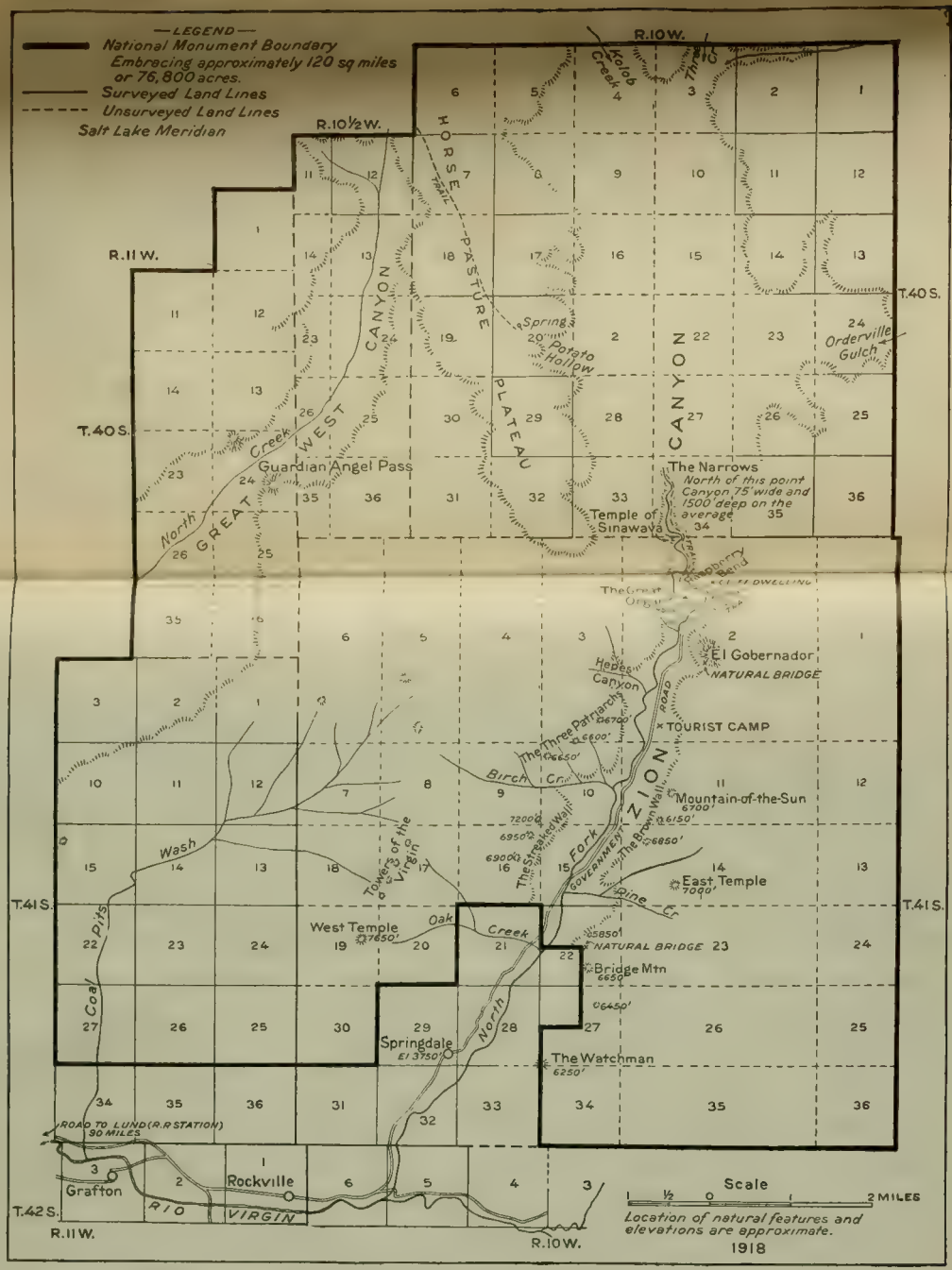
If a good trail could be built to the top, it would be more attractive to tourists, as the mountain is steep and rough.

REPORT OF THE LANDSCAPE ENGINEER.

CHAS. P. PUNCHARD, JR., Landscape Engineer.

GENERAL STATEMENT.

Although I was not officially connected with the National Park Service until August 1, 1918, my studies began on July 19, 1918, the time I arrived in Yellowstone National Park, Wyo., and therefore cover practically the entire fiscal year.



MAP OF ZION NATIONAL MONUMENT.

During the year seven national parks and four national monuments have been visited for purposes of personal study and advice to the superintendents upon matters of importance. One prospective project in Arizona was also visited, and a report was submitted covering the results of this investigation.

The past year has been a profitable one in many ways to some of the parks in the nature and scope of the landscape improvements made. Still, considerable time has been devoted to the study of problems the execution of which has not as yet been undertaken. It is hoped that the coming year will show greater results in the direction of actual accomplishment along this particular line, while at the same time new problems will arise which will have to be solved and worked into the whole scheme in the most satisfactory manner.

The landscape development of our parks is not an instantaneous work, but one which takes time to complete, depending naturally on the magnitude of the problems. The secret of a successful development will lie in the fact that an organized plan for it has been studied out and is being followed as conditions demand; and in the end, although it may be necessary to change some of the details from time to time in order to accommodate changing conditions, we will have a result which will be harmonious, attractive, well organized, and at the same time practicable and serviceable, while we shall have preserved the spirit of our parks and the object for which they were created.

In this work it is not the object to plant flower beds until we have laid our foundations. It is a work of control in order that what constructions it is necessary for us to make may be made in such a manner that we will disturb natural conditions as little as possible.

The nature of the work in the national parks has made it of more than the usual interest, on account of the many and varied problems encountered, the magnitude of the operations, and the materials with which to work, together with the widely differing local conditions with which it was necessary to become acquainted and adapt ideas and principles to in a comparatively short time, and the past year has been a most enjoyable, interesting, and profitable one.

There are conditions in some of our parks which have aroused the criticism of individuals and societies and which we regret. Still, inasmuch as these are inheritances, so to speak, so far as the Service is concerned, they must be accepted and worked upon from year to year as funds and time permit without sacrificing the maintenance of the necessities and the development of new projects which are being rapidly demanded by the popularity of our parks and reservations. Continued and intimate study of these unfortunate conditions develops the unjustness of much of this criticism and, on the other hand, the justification of some of it. However, these undesirable conditions are lessons by which we shall profit, and we will try to avoid them in the development of our newer or less intensively developed reservations.

Our greatest need is the cooperation of the public with constructive criticism. If the man or society who observes a condition which, to his mind, is not in harmony with the environment will call attention to the condition and at the same time make a suggestion of a remedy, it will be much easier for the Service to solve many of the problems than to have attention drawn to that condition in a seemingly destructive manner. I dare say there is not one unhappy condition in the sections of the reservations which I have visited and studied carefully which I have not noticed personally or had called to my attention. In many cases a remedy has not been suggested for the simple reason that it will take time to find a satisfactory and economical one.

My investigations have been conducted with the assistance of the superintendents through consultations, sketches, working drawings, and detailed instructions on the ground.

The work of the year has involved studies of problems for which the Service is directly responsible, and also matters pertaining to the regulation of the areas occupied by the several concessioners in the parks, with a view to preserving the natural conditions and health of those areas and at the same time making them accessible and comfortable for the tourist and camper.

In some parks it was possible to give considerable time to the study of the problems, as, for instance, in Yellowstone National Park, Wyo., two and one-half months were devoted to intensive study, and in Yosemite National Park, Calif., seven months were devoted to the problems encountered there. During this time, however, drawings were made for execution in other parks, and many letters were received from superintendents of other parks requesting advice on specific problems.

Following my visits to the several reservations I submitted reports covering the general situation and existing conditions, outlining in a general way the needs for future development, and in specific cases detailed reports were made of some of the larger and more extensive studies. These were intended to supplement my general reports. Where photographs and drawings would explain more clearly the thought in the development of these areas or the solution of specific problems, kodak pictures of the existing conditions were submitted, and sketch plans were made showing the nature of the proposed improvements.

Another very desirable improvement, and one which would greatly increase the popularity of the parks, particularly now that motor travel has become so popular, is better roads to our parks. A great deal has been done in some States in this direction, and in others much should be done, particularly on the main arteries.

With automobile travel increasing steadily each year and with a growing public interest in good roads, it is obvious that when the major portion of the main arteries is completed the travel to the national parks will increase to proportions as yet unheard of, and our accommodations, which at present seem ample and commodious, will be taxed to the limit of their capacity. Then we shall be confronted with the problem of increasing these accommodations proportionately and at the same time maintaining the natural beauty of the parks.

In connection with my journeys from one reservation to another, coming in contact as I did with persons directly interested in the development of the national parks, I was very much pleased to hear the expressions of satisfaction over the work accomplished by the Service in its organization of the national-park work and the interest shown in the ideals of the Park Service for the further development of the parks. Everywhere a keen interest was taken in the beautification of those areas devoted to a more or less commercial nature, and to the preservation of those areas which were purely scenic or of other interest for which they were set aside.

YOSEMITE NATIONAL PARK.

On account of the fact that I made Yosemite National Park my winter headquarters, a greater opportunity was offered for intensive study, not only in the valley itself but in the regions back in the mountains to the north, east, and south. Numerous trail trips were made possible by the late winter, and these afforded me an excellent opportunity to study the natural conditions in the more remote parts of the park. On these trips data were gathered which were used later in the study of the conditions on the valley floor with the idea of restoring this area to its former appearance. I shall mention this later under another heading.

Among the numerous problems which were investigated during the winter months, the following are some of the more important ones:

Lake Eleanor.—The unfortunate condition of the standing trees in the newer portion of the lake formed by the construction of the Lake Eleanor Dam, a unit in the San Francisco power and water development, was investigated during the early part of my visit, and the removal of these trees was urgently recommended.

It seems unnecessary to go into detail and explain carefully why live trees standing in 30 feet of water are unattractive, and also to mention the fact that within a short time these trees will die and a condition will result similar to that at Jackson Lake in the Jackson Hole country, south of Yellowstone, with all the desolation and untidiness of the appearance of that body of water. The danger of their polluting the water in this section of the lake was also investigated and the resultant effect upon the fish which might live in these waters.

The beauties of an open body of water are far superior to the appearance of Lake Eleanor at the time of my first visit, and later in the season when a second trip was made. The immediate correction of these conditions is most urgently recommended.

Mirror Lake.—Mirror Lake at the eastern end of Yosemite Valley was studied carefully and a survey was made to determine in a more or less definite manner the cost of removing the sediment and tree growth which have choked up this sheet of water.

This lake seems to be such a well-known and well-patronized object of interest in the valley it would hardly be consistent to allow the present condition to continue until the lake had become entirely filled with sediment. It seems that some steps should be taken for the correction of this condition, even though it cover a period of two or three years. The drive to the lake is attractive, the setting is interesting and beautiful, and it is the only body of still water on the valley floor. With the completion of the new road to Mirror Lake its popularity will increase to such an extent that unless something is done the result will be very disappointing.

Two recommendations for overcoming this situation were made.

Yosemite Falls Camp.—During the winter two or three conferences were held regarding the reconstruction and future development of the Yosemite Falls Camp, and the general plan as presented by the concessioners was approved, with a few minor alterations.

The location and development of this type of settlement on the floor of the valley is of great importance, and too great care can not be taken to obtain the most pleasing result, not only from the floor of the valley but from the rim of the valley also. The popularity of the trails out of the valley is such that unattractive structures badly placed and badly related will immediately become offensive from this viewpoint. Therefore, in the study of this camp the appearance of the group was considered from the Yosemite Falls Trail particularly, and it is believed that a very satisfactory composition has been the result.

El Portal entrance.—With the completion of the El Portal Road within the park and its connection with the lateral from Mariposa, the main entrance to the park at El Portal will acquire dignity and importance which it has never before enjoyed. A dignified, refined, attractive entrance gateway and lodge should be erected. Sketches for this improvement have already been made and, awaiting the approval of the Service, will serve as a basis upon which to work in the development of the working drawings for the completion of the structure.

Cemetery.—Sketches for the improvement of the small cemetery in the valley were made, and it is hoped that within the coming year some money can be spent toward the improvement of this area. The nature of the improvements is very simple, and practically amounts to clearing and grading the area.

Power plant.—The grounds in the vicinity of the new power house were measured and sketches for their improvement were prepared. The work as outlined is of a very simple and practical nature and should give the new building a setting which will enhance its value as a structure within the park. Vines were planted about the base of the building by Superintendent Lewis, and when these establish themselves and begin to cover the walls they will soften and break up the barren surfaces, which at the present time are uninteresting.

Thinning on the floor of the valley.—A detailed and extensive investigation was made of the existing conditions on the floor of the valley where the tree growth has encroached upon the meadows. Some research work was also done in this connection to ascertain, if possible, the appearance of the floor of the valley prior to the time when it was established as a State park and later taken over by the Federal Government. This research disclosed the fact that when the valley was occupied by the Indians there was practically no forest growth other than large trees on the valley floor, and the present growth has come only since its occupation by white men. In this connection mountain meadows in the park were studied with the idea of obtaining types upon which to base recommendations for future work.

Generally it was concluded that the present growth was greatly in need of attention and that thinning on the floor of the valley should be undertaken for two reasons—first, to preserve the health of the larger trees and as a protection against serious fires, and, second, that thinning and clearing of the meadows would tend to open up and develop very interesting open spaces and vistas on the valley floor. It is not the intention to do this work in a drastic manner and reclaim the floor of the valley entirely and thus reproduce the conditions which existed at the time of the Indians, but to confine the work to such lines as will make the woodlands safer from the standpoint of fires and also produce a pleasing landscape effect.

Roads.—One of the greatest needs of Yosemite Valley is an outlet from the floor of the valley to the east. It is possible to construct a road for this purpose up the canyon of the Merced River, passing below Vernal Falls and on through Little Yosemite to

Merced Lake. At some future time a connection should be made from this point to the Tioga Road at Tenaya Lake. This would give the automobile tourist an opportunity to make a complete circuit, avoiding the necessity of climbing the steep Big Oak Flat road grades to the Tioga road and then retracing to Tenaya Lake.

Aside from the practical administrative advantages, such a road would open up a country to the tourist which at the present time is never visited or seen unless the trip is made on horseback over the trails.

The road to Glacier Point could be greatly improved and made one of more scenic beauty if it were reconstructed nearer the rim of the valley, leaving the Wawona Road at a point near Fort Monroe and traversing the country from there to the point.

At the earliest opportunity the Service should abandon the section of road through the meadow to the west of the post office and relocate it in its old location nearer the south wall. The benefit derived from this change from a landscape point of view would greatly enhance the appearance of the valley floor, and it would cause no inconvenience to traffic.

Employees' residences.—A location near the old Lost Arrow Camp was selected as a site for the erection of future employees' residences. Four buildings have already been located and erected according to a design which was prepared for this purpose. This design is part of a larger plan for the development of the new village on the north side of the valley, which will follow closely in the footsteps of the completion of the new hotel, the foundation for which already exists.

Consideration was also given to the appearance of the grounds surrounding the older homes of the employees in "Army Row," and new lawns were put in as the first step in this work. It is proposed to follow this work with other constructions and also encourage the planting of shrubs and flowers about the foundations of the houses, eventually obtaining a very attractive street in this small settlement.

New walk and foot bridge.—A new foot bridge was constructed across the Merced River at a point east of the superintendent's residence, and from each end of this bridge a walk was constructed across the meadow. This connection of the north and south sides of the valley has fulfilled a long-felt need and will save much time and distance in travel by foot from points in the northwest part of the floor of the valley to and from the village.

Hetch Hetchy.—With the completion of the dam at Hetch Hetchy a new portion of the park will be opened up to automobile travel, provided the roadbed now fitted with rails for the transportation of materials for the construction of the dam is later developed as an automobile road; but in the event the rails are allowed to remain the tourist can enter by rail and, by the construction of a hotel at the dam site, find accommodations for trips into the surrounding country, which abounds in excellent fishing, trail and camping trips, and outdoor enjoyment of all kinds.

This development will make the Hog Ranch Ranger Station one of the important points of control. Consideration was given to a simple development of the station grounds and the erection of an entrance at the boundary line.

Although such a development is a glance into the future, it is one of importance and should be kept in mind and studied in preparation for the time when it becomes necessary to begin the work.

Fish hatchery.—The site for the erection of the State fish hatchery by the California Fish and Game Commission was approved, and during the winter the plans were discussed with the State architect. The first plans submitted did not seem to fulfill the ideals of the Service. Suggestions for their improvement were made, and the second series of sketches resulted in a building which will be one of the most attractive structures in the valley and will be a credit to the Service and the State authorities.

Wawona entrance.—A log gateway was erected at the Wawona entrance to the park from sketches prepared by the Park Service.

SEQUOIA NATIONAL PARK.

General statement.—Sequoia National Park was visited at the end of the season. Therefore I did not have a good opportunity to study conditions there under the stress of summer occupancy and travel. However, the most pressing problems were investigated and recommendations were made for their improvement, besides other problems which embraced a development extending into the future, and requiring perhaps several years for the full realization of the finished result. Some of these recommendations I shall mention here specifically, and others will be included in the paragraphs devoted to general recommendations which apply to all parks and other reservations.

Perpetuation of the sequoias.—The rapid inroads being made on these trees where they grow on private land make it imperative that this wonderful growth be preserved and perpetuated in every way possible. From time to time these great trees fall or lean at such angles near the roads that the safety of the tourists is endangered and it is necessary to remove them. Such conditions can not be overcome, but I would recommend that whenever an opportunity offers itself for reforestation in the Giant Forest the sequoia be planted as a step toward the further preservation of these great trees.

Camping conditions.—Considerable time was devoted to the study of the camps in the Giant Forest, and suggestions have been made as to a type of structure which would be more attractive than the present tent frames and canvas. The use of the redwood and cedar bark in the construction of these camps would add materially to the attractiveness of the buildings in the forest and would be more in keeping with the spirit of the colony than the canvas tents which are in use at the present time.

Crystal Cave.—When funds are available for the lighting and policing of Crystal Cave, Sequoia National Park will have added an attraction of unusual interest, and the completion of the trail to the entrance will make this interesting feature easily accessible.

The problem of the development of the entrance to this cave was studied with a great deal of interest, and suggestions were made which assumed the nature of the most natural development possible, making it appear to the visitor that he has come upon the cave in the course of a walk along a trail. It is desired that as little artificial work as possible be done at the entrance and that conditions be kept as nearly natural as possible, with only such improvements as are necessary for the comfort and ease of the visitor.

It is thought that a system of indirect electric lighting within the cave would be the most satisfactory, and by the use of such a system very beautiful light effects would be possible.

New hotel.—A new hotel is badly needed in the Giant Forest, and it should be constructed within a few years. Considerable thought should be given to its location and design, together with the location and design of the tents or cottages which will form a part of it.

Post-office building.—The present post-office building was studied with the idea of making it more attractive. In this connection the existing store and studio were taken as the types to be followed in order that the buildings in the village might be harmonious. With slight alterations and the use of bark, it is possible to so remodel this building that it will fit into the general scheme in a very satisfactory manner. Its location, however, should be changed in order to complete the group already begun. A new site was selected east of the Eddy studio. By the removal of the post-office from the present location a very dangerous corner will be opened up, and it will be possible to cut down the road at that point, thus obtaining a more satisfactory grade.

New Government buildings.—The completion of these has added buildings of attractive design to those in the forest, and it is hoped they will be followed as models for future structures.

Elimination of old Government barns and corral.—It is proposed to remove the structures now in use and construct new buildings in a less conspicuous place. A site on the Wolverton Road already selected for this purpose by Superintendent Fry was approved.

Lighting.—One of the most important needs of the Giant Forest is a modern system of lighting. At sunset among these great trees it soon becomes dark, and with the large number of automobiles and tourists in the grove, as was experienced this past season, it is very dangerous for pedestrians to find their way around unless they are very familiar with the ground. The efforts already made to transfer the old lighting plant at Yosemite to the Giant Forest should be continued.

Water supply.—After the falling off in the amount of snowfall during the winter the travel of the past season has seriously taxed the water supply of the Giant Forest, and it has been necessary to make very stringent rules as to the use of water. An investigation should be made of other available sources of supply with the idea of increasing the present facilities.

GENERAL GRANT NATIONAL PARK.

General Grant National Park in Tulare and Fresno counties, Calif., although small in comparison with the other national parks, contains within its 4 square miles of territory almost as much scenic interest as some of the larger areas and has possibilities for development which should make it one of the gems of the park system.

Its development can be controlled and results accomplished much more satisfactorily than the same undertakings can be worked out in the larger and more intensively developed parks, because the nature of the work here will be constructive from the beginning, and there are not the serious problems to overcome that are found in such reservations as Yosemite and Yellowstone.

Fortunately, all the buildings are old and rapidly becoming too small or unfit for further use, and as they are replaced it will be possible to locate and design them artistically and in that manner obtain a harmonious setting and a serviceable solution of the problem. With the completion of the administration building we shall have one that is well constructed, attractive, well placed, and a model and nucleus for the structures which will follow as the growth of the park demands them.

Future village.—The little meadow around which it is proposed to group such buildings of a commercial nature as the park demands, is a delightfully refreshing spot after the long, hot climb up the mountain road to the park. As a vestibule to the park no more pleasing place could have been selected for the tourist to stop for rest and reflection.

In the development of this area it will be necessary to construct a new store and post office, as the present building is small, unattractive, and not well situated. Therefore, the need for a new one is imperative. In connection with this and the administration building, which has already been erected, it is proposed to group the structures about three sides of a square which will be open toward the road, the administration building on one side, the store and post office on the rear, and a building for the photographer on the side opposite the administration building. By such an arrangement an orderly, attractive village group may be developed on a site which is suitable for the purpose, unoccupied at the present time, and centrally located.

Gateway.—The entrance to the park should be marked in a dignified manner, and for this purpose I have submitted to you a drawing for such a gateway as I think should be erected there. In studying the problem of such a structure I felt that it should be constructed of materials which could be found within the park or would suggest the interior of the park in some manner. The chief attraction of the park is the General Grant Tree. Therefore, redwood seemed to be the medium to use. To use sections of the trunks of the trees seemed to me a useless sacrifice of these monarchs which we hold so dearly and treasure so carefully. At the same time it did not seem that a satisfactory rustic gateway could be obtained in this manner. Therefore, I suggested the use of redwood from fallen trees, cedar bark, and local stone, all materials which would be found in the park, and instead of working for a rustic effect I worked for a semirustic effect, acknowledging frankly that it was a gateway. It should be dignified, perform its function frankly and definitely, and be harmonious and attractive.

A slight realignment of the road within the entrance to the park as it curves up the hill would be a very desirable undertaking. It would decrease the steep grade of the road at this point and at the same time give a more pleasing line. The cost of this realignment would not be excessive, and the benefit would be more than appreciated.

Development of meadow.—Further development of the meadow around which it is proposed to construct the necessary commercial buildings includes the location of a future hotel and camp. Sites were selected on the ground which overlooks the meadow. They are very desirable, especially the hotel site, which is upon a large ledge over which it is possible to erect a picturesque building in a very attractive manner.

General Grant Park lacks one feature with which all other parks are abundantly supplied. I would urgently recommend the acquisition of the area to the east of General

Grant National Park which includes Sequoia Lake. This is an artificial pond created when lumbering operations were being carried on in that vicinity years ago. Its outline is interesting, the shores are well wooded, there are camp sites around its entire shore line, and it is a most valuable and desirable property to include within the park. Recently many requests have been made of the owner for summer home sites on its shores, and should such a development be allowed it will be lost forever for development for park purposes.

MOUNT RAINIER NATIONAL PARK.

Mount Rainier National Park was visited on my return from the Hawaii National Park. In spite of the fact that snow prevented inspection beyond the 10-mile post, it was possible to study conditions at the entrance and also in the village of Longmire Springs. A later visit in August also enabled me to observe the park under the stress of summer travel and to visit Paradise Valley.

At Paradise Valley plans of the concessioners and extensions were inspected and approved, also the sites for these buildings. Some suggestions were also made regarding the arrangement of the government checking station here.

The site of the proposed seat to be erected near Sluiskin Falls as a memorial to Gen. Hazard Stevens and Mr. P. B. Van Trump, the men who made the first ascent of Mount Rainier, was inspected, and suggestions were made as to its treatment.

The acquisition of the Longmire Springs property by the Rainier National Park Co. has cleared up one of the most unsatisfactory situations in the park, and the meadow may now be improved in such a manner that the village of Longmire Springs will be an attractive one. Some thought, however, must be given to the appearance of the store buildings which are to be erected in the future along the village street.

Plans of the Standard Oil Co. for a filling station to be erected at Longmire Springs were approved, and the present building of logs and shingles is a very satisfactory structure. The cooperation of the Standard Oil Co. officials in this undertaking is to be commended, and this building is a credit to the company as well as to the Service.

YELLOWSTONE NATIONAL PARK.

Yellowstone National Park, on account of its age, popularity, and the fact that its administration up to the present time has been under three different branches of the Government, offers many problems of varying degrees of importance which must be solved.

The most difficult of these problems is the permanent camp situation, and practically my entire time was devoted to the study of conditions in them with a view to making such corrections as would be necessary in order to make them more attractive.

Permanent camps.—During the summer Mammoth Camp, Old Faithful Camp, and Canyon Camp were surveyed and the existing conditions mapped. During the winter plans were made for the rearrangement of two of these camps.

Temporary improvements were suggested for Mammoth Camp, which would suffice for a short time, but a definite plan was not developed. I do not feel that this camp is planned in such a manner that the best of the situation has been taken advantage of, and therefore I withheld definite future plans until such time as the situation could be gone into carefully and definite conclusions arrived at with the owner of the camp system.

During the 1919 season a few suggestions for the Old Faithful and Canyon Camps were executed. The results were satisfactory and a start was made toward a definite end along a definite plan.

East entrance.—Drawings were made for an entrance gate and lodge, office building, and stable at the east or Cody Entrance to the park. It was hoped that the construction might be undertaken during the fiscal year, but the present building material market makes only the smallest of structures possible under the authorized allotment.

Minor undertakings.—From time to time problems were worked out on the ground with the superintendent and the engineers, all of which had to do with the future appearance of the particular area.

Automobile camps.—A survey was made of all the available automobile camps in the park, and a plan with suggestions for their development was submitted to the superintendent.

Two large and important camps were constructed during the year, and their popularity was evident from their crowded condition each night. Their development involved the construction of rest rooms, toilets, fireplaces, water system, removal of stumps and dead wood, and the general policing of the grounds. Both camps are near general headquarters at Mammoth Hot Springs.

HAWAII NATIONAL PARK.

This park, consisting of three parcels, the active volcanoes Kilauea and Mauna Loa on the island of Hawaii and the extinct crates of the volcano Haleakala on the Island of Maui, were visited during the months of April and May, 1919.

At that time no funds were available for development, owing to the uncompleted negotiations regarding land exchanges. Nevertheless, a careful study was made of these areas and recommendations were submitted as to development and control. Camp sites were inspected, forest conditions noted, and roads and trails traveled and inspected.

Aside from the scientific interest exhibited by the volcanoes, the areas abound in tropical and more temperate vegetation, distant views, and other interesting landscape features.

Carefully developed and controlled, as outlined in my detailed report, these reservations and accommodations will care for the tourist and the student in a very satisfactory manner.

As soon as funds are available the most imperative needs will be administration and protection, road repairing, and the establishment of camp sites. Buildings will be necessary for administrative purposes, as there are none which might be used for that purpose at present.

GRAND CANYON NATIONAL PARK.

Early in January, 1919, a short visit was made to the Grand Canyon for the purpose of obtaining a brief survey of the existing conditions and general requirements.

Unfortunately, only two days could be devoted to this visit, but later conferences were held with Miss M. E. J. Coulter, architect and designer for the Fred Harvey Co., which owns and operates El Tovar Hotel and other properties in the park. These conferences acquainted the Service with the future plans of the Harvey Co. and formed a basis upon which to work when funds were available for improvement.

It is hoped that more time may be devoted to study here, for the possibilities offered demand the most careful work in order that we may have the most pleasing and satisfactory results.

MUIR WOODS NATIONAL MONUMENT.

This reservation was inspected and studied during the winter. It is unfortunate that there is not more money available for the development of some of the more important national monuments.

The proximity of this reservation to San Francisco is such that it is visited by picnic parties during the entire year. Fireplaces, benches, and trails should be built for the accommodation of these visitors. A water-supply system should be installed, and the underbrush should be cleared along the trails and drives to guard against fire.

The question of admitting automobiles to this area should be seriously considered. Personally, I would much prefer to see them parked at the entrance and the park enjoyed only by means of the trails and footpaths. The area is very small and the road is very narrow and short, and the terminus at the small hotel is such that only a few machines can be accommodated at one time. The topography will not allow any extensive development, and the beauty and grandeur of these beautiful woods will be seriously ruined by any extensive road system.

CASA GRANDE NATIONAL MONUMENT, PAPAGO SAGUARO NATIONAL MONUMENT, TUMACACORI NATIONAL MONUMENT.

These three small reservations, all in Arizona, were visited during the month of January, 1919. Reports have been submitted covering recommendations for their future development and control, and one drawing was submitted for an administration building at Casa Grande Ruin.

Though small, each exhibits an individual aspect of early southwestern life, history, and vegetation, and each should be developed slowly as funds and demands permit.

SPECIAL RECOMMENDATIONS AND URGENT NEEDS.

Increase in building allotment.—One of the most important requirements in the construction of park buildings is an increase in the amount allowed for their construction. The present allotment of $1,500 is not sufficient, with the present condition of the building material market. With the price of lumber from 50 per cent to 100 per cent higher than ever before, it is impossible to construct buildings large enough to meet the requirements, unless material is used from buildings which have been condemned as unsafe for further use. These buildings are rapidly becoming less and less in some parks, and in others where there are no such buildings to salvage the present allotment is hardly sufficient to purchase the necessary material, to say nothing of labor.

I urgently recommend that the allotment be increased from $1,500 to $2,500.

Naming trees.—In General Grant National Park, as well as in Sequoia National Park and the Mariposa, Tuolumne, and Merced groves in Yosemite National Park, a heterogeneous collection of names has been attached to the great sequoias. I can not express myself too strongly against this practice. These names embrace those of persons, colleges, cities and towns, States, countries, and many others. They are displayed on all kinds of materials and in every conceivable way.

For educational purposes and for purposes of association, I do not object to the naming of notable specimens, such as the General Sherman tree, the General Grant tree, the Grizzly Giant, and so on, where it may be desirable to call attention and associate their proportions in some manner; but I strongly object to having a forest of these wonderful trees tagged with a collection of names the majority of which mean nothing to the average visitor.

If it seems desirable or advantageous to attach names to these trees, I would suggest that the example of the tree in the Muir Woods which has been dedicated to Gifford Pinchot by the Sierra Club be followed. Here a very attractively designed bronze tablet has been placed on a large boulder, which was rolled to the foot of the tree. It is hardly noticeable, simple in design, the trunk of the tree has not been injured or disfigured, and it is a very satisfactory method of accomplishing its purpose.

Maps.—There is a growing necessity for more detailed maps of the more important and thickly settled portions of our national parks. The topographic maps of the Geological Survey are sufficient for administrative and reconnoissance purposes, but where permanent improvements have been made which have involved the erection of buildings, the installation of water pipes and sewers, the construction of roads, underground wire conduits, etc., and there is no record, the only known location of many of these features is the memory of the plumbers and workmen who installed them. In some of the parks water mains are continually being uncovered, the existence of which has not been known.

For purposes of record and as an aid in planning for the future, I strongly recommend the preparation of such maps, showing the locations of all buildings, roads, water and sewer mains, electric light, power, and telephone lines, bridges, and any other features which will control or influence construction in the future. It would be desirable and of inestimable value if these maps could also show the nature of the topography by contours—1-foot for small areas and 5-foot for more extensive areas.

Each superintendent should be requested to prepare a map of his reservation showing these features, in order that succeeding superintendents and engineers may work with some degree of definiteness in planning new work.

Grazing.—The policy of the Service in relation to this very important question—permitting grazing only in certain remote sections of some of the national parks—should be very stringently adhered to.

The destruction to the small mountain meadows caused by intensive grazing of large numbers of cattle will become a very serious matter. In Yosemite the appearance of these meadows after only one year of grazing as a war measure was very disheartening indeed. The forest floor of the Sierra offers very little forage on account of the great

areas of rock and the steep canyon walls. Therefore the small meadows suffer the greatest amount of destruction, and their resources are soon depleted by concentrated feeding.

On one trip to the Hetch Hetchy country during round-up time I made it a point to talk with the foremen of the "cow-punchers" with the idea of obtaining first-hand and frank opinions as to the value of cattle grazing in that section of the park. Economically it was not a success. It took six "cow-punchers" two months to round up less than a thousand head of cattle, and when they were in the corrals their appearance was far from that expected from the point of view of marketable beef. The average day's round-up for these 6 men was not over six cattle, and a good day resulted in 20 animals. Dogs were employed for this purpose, and when the opportunity offered itself they would chase deer and other game. The country was so rough and rugged that it was hard to herd the cattle when they were finally brought to the trails, and at the end of the season fewer cattle were driven out than had been driven in in the spring.

Private holdings.—The possession of private lands in national parks, unless attended by a spirit of cooperation and appreciation for the parks, will in the future result in another serious question for the Service to deal with.

The growing desire to camp out for long periods of time, particularly in the California parks, is rapidly becoming more and more popular, and it will not be long before the owners of these private holdings will commercialize them to the extent of dividing them into small lots and selling them at popular prices. The serious side of this question lies in the fact that although these areas are within the park, we will have no control over them, and as they develop and become popular, and possibly thickly settled, questions of sanitation and water supply will arise which will have to be solved and very carefully in some reservations.

Such areas when not under the exclusive jurisdiction of the Federal Government are not game preserves, and regulations as to game protection are without effect. Deer and other game will be frightened away from these sections, and stray bullets may cause serious damage within the park area.

Urgent needs.—1. More thought in regard to tree cutting and the removal from the roadsides of fallen trees and wood which is suitable for firewood.

2. More thought to the location of borrow pits along the park roads and their relocation in out-of-the-way places.

3. Employment of architects by the various private enterprises engaged in the parks, as the demands upon the Service by these concerns for work of this kind, together with its own work, make it almost impossible to keep abreast of current demands.

4. No temporary buildings to be allowed for the use of these private enterprises. Once constructed, they become permanent after a year or two, and it is always difficult to remove them.

5. Reforestation of areas which have been burned over or cut over for firewood.

6. Parapets at the dangerous turns and on high embankments on the park roads.

7. Enlargement of automobile camps and the installation of adequate water and sanitary systems and the construction of fireplaces, seats, and tables.

APPENDIX C.

STATISTICS.

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Statement of appropriations made for and received revenues from the various national parks and national monuments, and expenditures made therefrom during the fiscal years 1904–1919, inclusive; also appropriations for the fiscal year 1920 1187

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STATISTICS.

Visitors to parks, 1907–1919.

Name of park.	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
Hot Springs Reservation	[1]	[1]	[1]	[2] 120,000	[2] 130,000	[2] 135,000	[2] 135,000	[2] 125,000	[2] 115,000	[2] 118,740	[2] 135,000	[2] 140,000	[2] 160,490
Yellowstone National Park	16,414	19,542	32,545	19,575	23,054	22,970	24,929	20,250	51,895	35,849	35,400	21,275	62,261
Sequoia National Park	[2] 900	1,251	854	2,407	3,114	2,923	3,823	4,667	7,647	10,780	18,510	15,001	30,443
Yosemite National Park	7,102	8,850	13,182	13,619	12,536	10,884	13,735	15,145	33,452	33,390	34,510	33,527	58,362
General Grant National Park	[2] 1,109	1,773	798	1,178	2,160	2,240	2,756	3,735	10,523	15,360	17,390	15,496	21,574
Mount Rainier National Park	2,068	2,826	5,968	8,000	10,306	8,946	13,501	15,038	35,166	23,989	35,568	43,901	55,232
Crater Lake National Park	[2] 2,600	5,275	4,171	[2] 5,000	[2] 4,500	5,235	6,253	7,096	11,371	12,265	11,645	13,231	16,645
Wind Cave National Park	2,751	3,171	3,216	3,387	2,887	3,199	3,988	3,582	2,817	[2] 9,000	16,742	14,431	26,312
Platt National Park	[2] 28,000	[2] 26,000	[2] 25,000	[2] 25,000	[2] 30,000	[2] 31,000	[2] 35,000	[2] 30,000	[2] 20,000	[2] 30,000	[2] 35,000	[2]36,000	[2] 25,000
Sullys Hill Park	[2] 400	[2] 250	[2] 190	[2] 190	[2] 200	[2] 240	[2] 300	[2] 500	[2] 1,000	[2] 1,500	2,207	4,188	4,026
Mesa Verde National Park	(1)	[2] 80	165	250	206	230	289	502	663	1,385	2,223	2,058	2,287
Glacier National Park					[2] 4,000	6,257	12,138	14,168	14,265	12,839	18,387	9,086	18,956
Rocky Mountain National Park									[2] 31,000	[2] 51,000	[2] 117,186	[2] 101,497	[2] 169,492
Hawaii National Park										(1)	(1)	(1)	(1)
Lassen Volcanic National Park										(1)	[2] 8,500	[2] 2,000	2,500
Mount McKinley National Park											(1)	(1)	(1)
Grand Canyon													37,745
Lafayette													[2] 64,000
Total	61,335	69,018	86,089	198,606	223,957	229,084	251,703	235,193	334,799	356,097	488,268	451,691	756,325

[1] No record.

[2] Estimated.

Automobile and motorcycle licenses issued during seasons, 1915–1919.

Name of park.[1]	1915		1916		1917		1918		1919[2]	
	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.
Yellowstone	958	.....	[illegible],430	.....	5,326	.....	4,447	16	9,543	38
Sequoia[3]	343	11	731	4	952	.....	766	2	1,665	6
Yosemite	3,901	.....	3,932	.....	5,320	.....	5,554	59	[4] 10,093	94
General Grant	1,604	40	1,730	41	2,267	.....	2,350	27	2,982	26
Mount Rainier	3,235	247	2,973	99	5,906	108	7,353	122	8,949	113
Crater Lake	2,015	31	2,051	29	2,094	15	1,959	5	3,196	14
Mesa Verde	86	.....	178	2	368	.....	338	.....	464	0
Glacier	467	16	511	11	1,292	.....	1,066	2	1,694	1
Total	12,609	345	15,536	186	23,525	123	23,833	233	38,586	292

[1] No licenses required for Wind Cave, Hot Springs, Platt, Hawaii, Lassen Volcanic, Sullys Hill, Rocky Mountain, Grand Canyon, and Lafayette National Parks. No roads in Mount McKinley Park.
[2] Number of licenses formally reported to Washington, to and including Oct. 10, 1919.
[3] Licenses required only for Giant Forest Road.
[4] Includes 5,360 autos, the owners of which surrendered Yosemite Valley Highway Association certificates in lieu of payment of entrance fee.

Licenses not required in certain parks because of small road mileage or unimproved condition of roads (see footnote 1). Licenses also not required for travel on unimproved roads in other parks. No license required for operating cars on official business.

Receipts collected from automobiles and motorcycles during seasons, 1915–1919.

Name of park.[1]	1915	1916	1917	1918	1919[2]
Yellowstone	$7,076.57	$25,387.50	$30,945.00	$33,392.50	$71,337.50
Sequoia[3]	1,183.56	1,600.00	2,380.00	1,920.00	4,134.50
Yosemite	13,457.71	19,885.00	26,600.00	27,888.00	23,474.00
General Grant	1,685.50	957.50	1,133.50	1,188.50	1,504.00
Mount Rainier	16,371.61	13,194.00	14,181.50	18,225.50	22,167.00
Crater Lake	2,102.00	4,402.60	5,253.00	4,[illegible]2.50	7,991.50
Mesa Verde	85.07	95.50	184.00	338.00	674.00
Glacier	573.99	312.00	1,292.00	1,068.00	2,665.00
Total	42,536.11	65,833.50	90,969.00	88,923.00	133,947.50

[1] No licenses required for Wind Cave, Hot Springs, Platt, Hawaii, Lassen Volcanic, Sullys Hill, Rock Mountain, Grand Canyon, and Lafayette National Parks. No roads in Mount McKinley Park.
[2] Received in Washington, to and including Oct. 10, 1919.
[3] License required only for Giant Forest Road.

Private automobiles entering the national parks during seasons, 1916–1919.

Name of park.	1916	1917	1918	1919[1]
Yellowstone	3,445	5,703	4,734	10,737
Sequoia[2]	736	2,334	1,627	3,852
Yosemite	4,043	6,521	7,021	12,109
General Grant	1,778	2,153	2,438	3,366
Mount Rainier	3,070	5,894	7,602	10,434
Crater Lake	2,649	2,756	3,105	4,637
Wind Cave[3]	[2]2,500	4,837	4,815	8,240
Mesa Verde	185	364	371	436
Glacier	902	1,121	1,065	1,697
Rocky Mountain[3]	[4]10,050	[4]23,004	[4]20,588	[4]33,638
Grand Canyon[3]	.....	.....	.....	1,575
Lafayette[3]	.....	.....	.....	[4]7,000
Total	29,358	54,692	53,966	97,721

[1] Automobiles entering parks with or without licenses, to and including Oct. 12, 1919.
[2] License required only for Giant Forest Road.
[3] No license required.
[4] Estimated.

National park and monument areas administered by the National Park Service in relation to the States and Territories in which they are located.

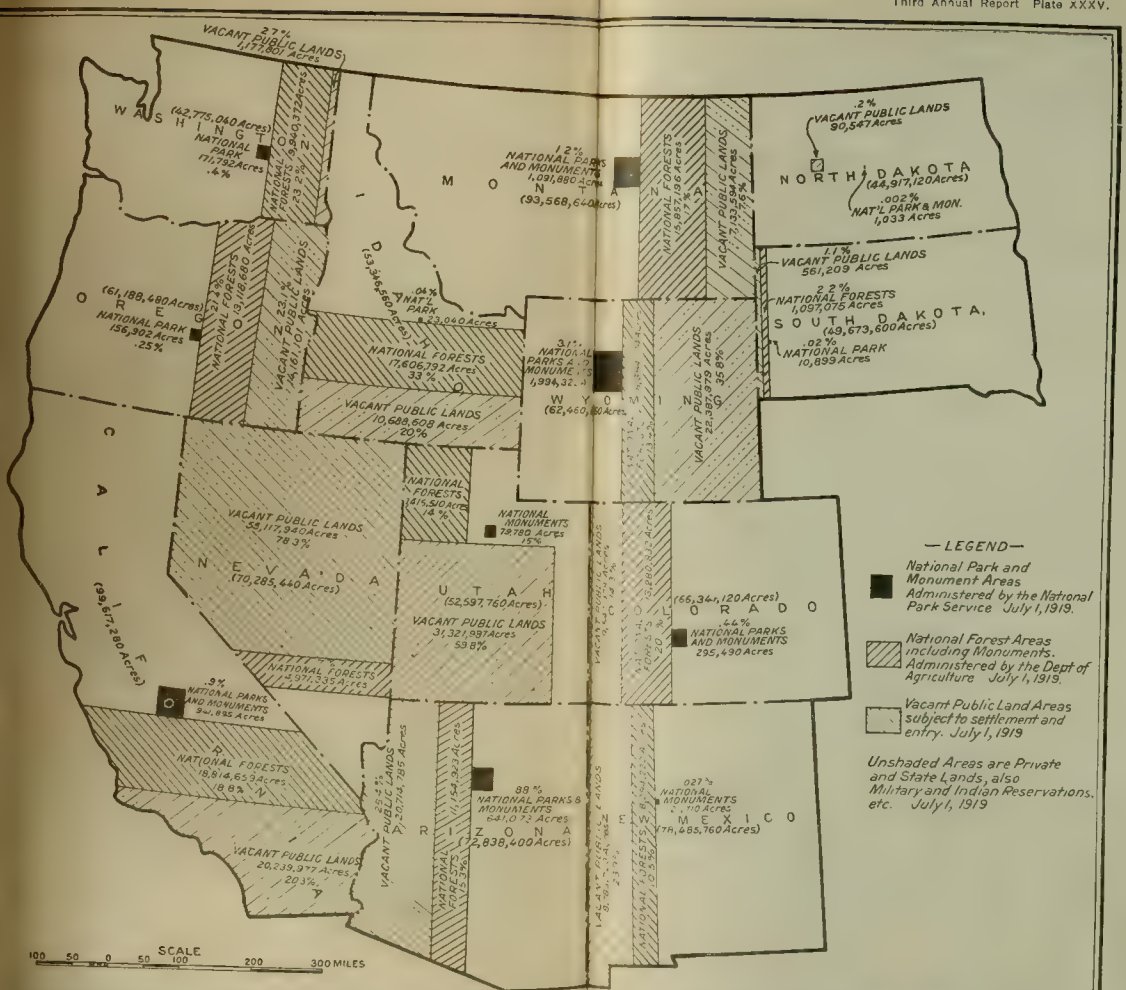
State or Territory.	Area.	Parks and monuments.	Relation.
	Acres.	*Acres.*	*Per cent.*
Alaska	378,165,760	2,496,057	0.66
Arizona	72,838,400	641,073	.88
Arkansas	34,134,400	912	.003
California	99,617,280	941,895	.94
Colorado	66,341,120	295,490	.44
Hawaii	[1] 3,160,320	34,295	1.08
Idaho	53,346,560	23,040	.04
Maine	21,145,600	5,000	.02
Montana	93,568,640	1,091,880	1.16
New Mexico	78,485,760	21,710	.03
North Dakota	44,917,120	1,033	.002
Oklahoma	44,836,480	848	.002
Oregon	61,188,480	156,902	.25
South Dakota	49,673,600	10,899	.02
Utah	52,597,760	79,780	.15
Washington	42,775,040	171,792	.40
Wyoming	62,460,160	1,994,322	3.17

[1] Area of the Islands of Hawaii and Maui on which are located the Hawaii National Park.

National park and monument areas administered by the National Park Service in relation to the public lands.[1]

State or Territory.	Public lands.[2]	Parks and monuments.[2]	Relation.
	Acres.	*Acres.*	*Per cent.*
Alabama	74,158	.....	.....
Alaska	355,277,817	2,496,057	0.70
Arizona	32,510,781	641,073	1.97
Arkansas	1,210,332	912	.07
California	39,996,531	941,895	2.35
Colorado	23,124,200	295,490	1.27
Florida	426,052	.....	.....
Hawaii[3]	1,640,243	34,295	2.08
Idaho	23,318,440	23,040	.08
Louisiana	30,129	.....	.....
Maine	32,860	5,000	15.21
Michigan	162,572	.....	.....
Minnesota	1,234,547	.....	.....
Mississippi	39,933	.....	.....
Missouri	78	.....	.....
Montana	24,182,670	1,091,880	4.55
Nebraska	298,770	.....	.....
Nevada	60,089,275	.....	.....
New Hampshire	332,778	.....	.....
New Mexico	27,101,655	21,710	.08
North Dakota	91,589	1,033	1.12
Oklahoma	83,322	848	1.01
Oregon	27,436,683	156,902	.57
South Carolina	18,454	.....	.....
South Dakota	1,669,183	10,899	.65
Tennessee	178,784	.....	.....
Utah	38,817,277	79,780	.20
Virginia	312,309	.....	.....
Washington	11,289,965	171,792	1.52
West Virginia	91,168	.....	.....
Wisconsin	6,934	.....	.....
Wyoming	32,766,475	1,994,322	6.11
Total	708,895,955	7,966,928	1.12

[1] Includes vacant public lands, national parks and monuments, and national forests, but does not include military and Indian reservations, reclamation and power site withdrawals, etc.
[2] July 1, 1919.
[3] Public lands of the Territory of Hawaii are under the Territorial land department.


WASHINGTON
(42,775,040 Acres)
NATIONAL PARKS 171,792 Acres .4%
NATIONAL FORESTS 3,940,372 Acres 9.23%
VACANT PUBLIC LANDS 1,177,807 Acres 2.7%
OREGON
(61,188,480 Acres)
NATIONAL PARK 156,902 Acres .25%
NATIONAL FORESTS 13,818,680 Acres 22.7%
VACANT PUBLIC LANDS 14,161,101 Acres 23.2%
CALIFORNIA
(99,617,280 Acres)
NATIONAL FORESTS 18,814,659 Acres 18.8%
VACANT PUBLIC LANDS 20,239,977 Acres 20.3%
NATIONAL PARKS AND MONUMENTS 341,695 Acres .9%
NEVADA
(70,285,440 Acres)
VACANT PUBLIC LANDS 55,117,940 Acres 78.3%
NATIONAL FORESTS 4,971,535 Acres
UTAH
(52,597,760 Acres)
VACANT PUBLIC LANDS 31,321,987 Acres 59.8%
NATIONAL FORESTS 415,520 Acres .4%
NATIONAL MONUMENTS 79,780 Acres .15%
ARIZONA
(72,838,400 Acres)
NATIONAL PARKS & MONUMENTS 641,073 Acres .88%
NATIONAL FORESTS 15,954,560 Acres 21.9%
VACANT PUBLIC LANDS 20,714,285 Acres 28.5%
MONTANA
(93,568,640 Acres)
NATIONAL PARKS AND MONUMENTS 1,091,880 Acres 1.2%
NATIONAL FORESTS 15,857,196 Acres 17%
VACANT PUBLIC LANDS 7,133,594 Acres 7.6%
NATIONAL PARK 23,040 Acres .04%
WYOMING
(62,460,160 Acres)
NATIONAL PARKS & MONUMENTS 1,934,32.4 3.1%
NATIONAL FORESTS 17,606,792 Acres 33%
VACANT PUBLIC LANDS 10,688,608 Acres 20%
VACANT PUBLIC LANDS 22,387,379 Acres 35.8%
COLORADO
(66,341,120 Acres)
NATIONAL PARKS AND MONUMENTS 295,490 Acres .44%
NATIONAL FORESTS 14,680,320 Acres 22%
VACANT PUBLIC LANDS 4,161,280 Acres 6.2%
NEW MEXICO
(77,685,760 Acres)
NATIONAL MONUMENTS 210 Acres .027%
NATIONAL FORESTS 8,592,320 Acres 11%
VACANT PUBLIC LANDS 14,447,360 Acres 18.5%
NORTH DAKOTA
(44,917,120 Acres)
VACANT PUBLIC LANDS 90,547 Acres .2%
NAT'L PARK & MON. 1,033 Acres .002%
SOUTH DAKOTA
(49,673,600 Acres)
VACANT PUBLIC LANDS 561,209 Acres 1.1%
NATIONAL FORESTS 1,097,075 Acres 2.2%
NATIONAL PARK 10,899 Acres .02%
— LEGEND —
National Park and Monument Areas Administered by the National Park Service July 1, 1919.
National Forest Areas including Monuments. Administered by the Dept of Agriculture July 1, 1919.
Vacant Public Land Areas subject to settlement and entry. July 1, 1919
Unshaded Areas are Private and State Lands, also Military and Indian Reservations, etc. July 1, 1919
SCALE
100 50 0 50 100 200 300 MILES

MAP OF WESTERN PORTION OF THE UNITED STATES SHOWING RELATION OF THE NATIONAL PARK AND MONUMENT AREAS TO THE SEVERAL STATES, THE PUBLIC LANDS, AND THE NATIONAL FORESTS.

National park and monument areas administered by the National Park Service in relation to the national forests, including national monuments administered by the Forest Service.

State or Territory.	National forests.[1]	Parks and monuments.[1]	Relation.
	Acres	*Acres.*	*Per cent.*
Alabama	[2] 36,418		
Alaska	20,574,543	2,496,057	12.13
Arizona	11,154,923	641,073	5.75
Arkansas	901,821	912	1.01
California	18,814,659	941,895	5.00
Colorado	13,280,832	295,490	2.22
Florida	308,268		
Georgia	[3] 107,653		
Hawaii		34,295	
Idaho	17,606,792	23,040	.13
Maine	[3] 27,860	[4] 5,000	17.92
Michigan	89,466		
Minnesota	1,044,233		
Montana	15,957,196	1,091,880	6.84
Nebraska	205,944		
Nevada	4,971,335		
New Hampshire	332,778		
New Mexico	8,294,222	21,710	.26
North Carolina	[3] 240,844		
North Dakota		1,033	
Oklahoma	61,480	818	1.37
Oregon	13,118,680	156,902	1.19
Porto Rico	12,443		
South Carolina	18,454		
South Dakota	1,097,075	10,899	.99
Tennessee	[3] 178,784		
Utah	7,415,510	79,780	1.07
Virginia	[3] 312,309		
Washington	9,940,372	171,792	1.73
West Virginia	[3] 91,168		
Wyoming	8,384,174	1,994,322	23.78
Total	154,580,236	7,966,928	5.15

[1] July 1, 1919.
[2] 13,655 acres of United States public lands and 22,763 acres of lands purchased under Weeks Act.
[3] Purchased under the Weeks Act.
[4] Donated to the United States. Other donations of lands in national monument areas amount to 455 acres.

Statement of appropriations made for, and received revenues from, the various national parks and national monuments, and expenditures made therefrom during the fiscal years 1904–1919, inclusive; also appropriations for the fiscal year 1920.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Hot Springs Reservation:				
1904	$36,050.00	[1]	$18,430.00	[1]
1905	8,000.00	[1]	19,330.00	[1]
1906	6,000.00	[1]	19,748.33	[1]
1907			20,165.00	$19,938.41
1908			28,090.00	21,115.56
1909			34,475.00	19,699.27
1910			36,540.00	28,401.97
1911	$2,935.00	$2,935.00	36,060.00	56,375.33
			[2] 82,518.00	
1912			35,279.16	3,267.96
				[3] 42,957.18
1913			40,711.00	[4] 29,438.25
				[5] 34,581.57
			[6] 1,287.96	[6] 1,273.70

[1] Figures not available.
[2] Proceeds from sale of Government lots (lot fund).
[3] Expenditure from lot fund.
[4] Includes $1,272.71 expended in making survey and preparation of plans, etc., for sewer system, city of Hot Springs.
[5] Contributed by city of Hot Springs on account of sewer system, $14.20 returned to city.

Statement of appropriations made for, and received revenues from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Hot Springs Reservation—Continued.				
1914			$38,380.00	[1] $36,658.62
1915			37,877.66	36,941.95
1916			37,926.32	40,261.14
1917			35,611.75	31,302.98
1918			28,883.44	42,822.02
1919	[2] $140,000.00		52,109.15	32,130.36
Yellowstone:				
1904	8,940.30	[3]		
1905	7,500.00	[3]		
1906	7,500.00	[3]	1,522.50	[3]
1907	7,500.00	$7,498.64	1,838.96	3,647.04
1908	8,000.00	7,999.40	4,699.65	4,228.37
1909	[4] 8,000.00 [5] 2,500.00	7,997.44 1,962.53	4,790.29	3,661.47
1910	8,000.00	7,999.71	5,110.05	3,359.80
1911	8,500.00	8,499.96	23,420.13	7,998.47
1912	8,500.00	8,500.00	16,476.38	8,103.41
1913	8,500.00	8,500.00	21,980.10	6,449.97
1914	8,500.00	8,500.00	15,439.23	13,843.24
1915	8,500.00	8,500.00	20,307.40	12,884.18
1916	8,500.00	8,491.41	46,628.49	26,350.96
1917	8,500.00	8,500.00	54,795.69	53,775.61
1918	10,500.00	9,645.82	71,393.56	96,812.34
1919	334,920.00	284,742.72	42,775.50	[6]
1919	[7] 3,259.48	539.44		
1920	255,500.00			
1920 (deficiency)	25,000.00			
Sequoia:				
1904	10,089.69	[3]		
1905	10,000.00	[3]		
1906	10,000.00	[3]		
1907	10,000.00	9,919.82	159.50	
1908	15,550.00	15,333.50	43.15	18.97
1909	15,550.00	15,373.96	46.57	
1910	15,550.00	15,514.19	121.78	
1911	15,550.00	15,543.34	255.65	31.25
1912	15,550.00	15,549.20	305.16	48.25
1913	15,550.00	15,549.52	353.85	70.81
1914	15,550.00	15,549.27	4,094.21	83.94
1915	15,550.00	15,549.65	1,975.03	3,498.23
1916	15,550.00	15,549.75	5,169.86	4,740.75
1917	22,300.00 [8] 50,000.00	15,605.28 50,000.00	10,326.60	415.04
1918	25,000.00	24,578.71	13,402.53	25,508.45
1919	30,510.00	30,372.18	9,772.52	[6]
1920	35,000.00			
Yosemite:				
1904	6,000.00	[3]		
1905	8,400.00	[3]		
1906	25,400.00	[3]	1,000.00	
1907	5,750.00	5,705.24	9,193.04	1,000.00
1908	30,000.00	29,508.58	14,390.06	7,131.37
1909	30,000.00	29,969.86	15,851.17	5,024.84
1910	30,000.00	29,983.82	21,373.18	34,486.09
1911	62,000.00 [9] 12,000.00	62,000.00 [9] 11,646.37	35,765.48	19,050.39
1912	50,000.00	49,999.68	23,855.77	35,970.68
1913	80,000.00	80,000.00	19,495.83	16,431.16
1914	125,000.00	124,798.49	23,406.14	9,903.58
1915	100,000.00	99,235.22	37,019.20	40,699.30
1916	75,000.00	74,996.88	49,878.42	52,961.53
1916 (deficiency)	196.80	196.80		
1917	250,000.00	249,987.45	53,500.66	55,098.45
1918	235,000.00	226,159.12	65,865.65	88,975.62
1919	255,000.00	219,677.10	57,520.03	[6]
1920	200,000.00			

[1] Includes 99 cents expended on account of survey sewer system.
[2] Made available during fiscal year 1920 by sundry civil act approved July 19, 1919 (Public No. 21, 66th Cong.).
[3] Figures not available.
[4] Administration and protection.
[5] Marking unmonumented portions of park boundaries.
[6] Expenditure of revenue for park purposes not authorized. Sundry civil act of June 12, 1917 (40 Stat., 153).
[7] Unexpended balance of 1918 War Department appropriation of $20,000 made available under Interior Department during 1919. Sundry civil act of July 1, 1918 (40 Stat., 678).
[8] For purchase of private holdings.
[9] Appropriations without year, for examination of water supply for city of San Francisco.

Statement of appropriations made for, and received revenues from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
General Grant:				
1904	$2,058.65	(1)		
1905	2,000.00	(1)		
1906	2,000.00	(1)		
1907	2,000.00	$1,988.75		
1908	2,000.00	1,914.76	$63.75	
1909	2,000.00	1,999.93		
1910	2,000.00	1,999.90	50.00	
1911	2,000.00	1,999.89	210.64	$18.88
1912	2,000.00	1,998.60	173.54	.99
1913	2,000.00	1,999.20	158.68	503.01
1914	2,000.00	2,000.00	429.64	1.59
1915	2,000.00	2,000.00	560.89	355.68
1916	2,000.00	1,999.36	1,795.50	481.46
1917	2,000.00	1,999.55	1,153.78	536.97
1918	2,000.00	1,999.97	1,801.63	3,951.88
1919	4,500.00	4,007.58	1,063.90	(2)
1920	6,000.00			
Mount Rainier:				
1907	[3] 2,500.00	2,407.91	205.22	
1908	3,000 00	2,965.59	170.00	8.96
1909	3,000.00	2,961.61	1,104.79	27.65
1910	3,000.00	3,000.00	9,053.79	2,763.86
1911	3,000.00	2,998.90	7,748.48	5,342.47
1912	5,400.00	5,399.99	5,370.36	9,363.33
1913	20,000.00	19,989.70	7,301.62	6,791.80
1914	23,400.00	23,347.05	9,040.10	6,039.42
1915	51,000.00	50,907.79	12,893.29	5,513.46
1916	30,000.00	30,000.00	19,317.99	15,026.08
1917	30,000.00	29,999.19	14,346.80	17,617.04
1918	75,000.00	74,846.42	17,241.25	34,715.96
1919	24,600.00	24,562.33	17,336.47	(2)
1920	32,500.00			
Crater Lake:				
1904	2,000.00	(1)		
1905	3,000.00	(1)		
1906	3,000.00	(1)		
1907	3,000.00	2,989.75	10.00	(4)
1908	7,315.00	7,314.65		
1909	3,000.00	2,999.21	15.00	
1910	3,000.00	2,999.97	11.00	
1911	3,000.00	2,999.77	30.00	
1912	3,000.00	2,998.75	323.00	
1913	3,000.00	2,978.41	784.18	
1914	7,540.00	7,483.61	793.00	
1915	8,040.00	7,884.59	1,359.50	
1916	8,000.00	7,986.84	2,402.04	
1917	8,000.00	7,999.88	4,565.25	
1918	15,000.00	14,738.44	5,505.72	
1919	13,225.00	13,203.53	5,958.21	(2)
1920	28,225.00			
Platt:				
1906	(5)		37,307.44	
1907			178.00	7,082.25
1908			7,021.00	10,552.26
1909			272.00	15,764.27
1910			164.50	11,734.74
1911	5,000.00	4,994.64	422.75	779.06
1912	10,000.00	9,999.34	165.50	219.84
1913	8,000.00	7,999.95	49.95	100.11
	[6] 17,500.00	[6] 10,120.73	[6] 17,500.00	[6] 10,119.00
1914	8,000.00	7,988.55	282.81	67.48
1915	8,000.00	8,000.00	241.76	178.87
1916 (deficiency, $10,000)	18,000.00	16,974.49	301.11	44.35
1917	8,000.00	8,000.00	434.11	138.28
1918	7,180.00	7,179.84	1,010.40	1,699.88
1919	7,500.00	7,445.35	482.63	(2)
1920	6,000.00			

[1] Figures not available.
[2] Expenditure of revenues for park purposes not authorized. Sundry civil act of June 12, 1917. (40 Stat., 153.)
[3] No appropriation made for Mount Rainier prior to 1907.
[4] Expenditure of revenues of Crater Lake Park for park purposes therein not authorized by statute.
[5] No appropriation for Platt Park prior to 1911 fiscal year. Land prior to creation of park included in Sulphur Springs Reservation.
[6] Construction sanitary sewer, like amount being contributed by the city of Sulphur, Okla.; $7,380.94 returned to city.

Statement of appropriations made for, and received revenues from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Wind Cave:				
1904	[1] $2,500.00	[2]		
1905	2,500.00	[2]		
1906	2,500.00	[2]		
1907	4,400.00	$4,398.08		
1908	2,500.00	2,433.54	$200.00	
1909	2,500.00	2,335.37	450.00	$220.80
1910	2,500.00	2,500.00	523.25	62.88
1911	2,500.00	2,413.60	340.00	562.26
1912	2,500.00	2,499.86	675.00	278.56
1913			528.26	1,197.39
1914	2,500.00	2,500.00	246.17	366.72
1915	2,500.00	2,496.97	2,342.90	606.16
1916	2,500.00	2,497.82	2,590.89	981.57
1917	2,500.00	2,499.87	1,632.60	1,013.04
1918	2,500.00	2,498.40	4,082.60	8,006.53
1919	4,000.00	3,967.33	2,533.15	[3]
1920	4,000.00			
Sullys Hill:				
1914	500.00			
Mesa Verde:				
1907–8	[4] 7,500.00	7,455.82		[5]
1909	7,500.00	7,348.33		
1910	7,500.00	7,443.09		
1910–11 (for examination of coal lands in park)	2,000.00	947.75		
1911	20,000.00	19,808.63	100.00	
1912	7,500.00	7,351.54	898.92	
1913	15,000.00	14,956.91	615.21	
1914	10,000.00	9,880.30	679.00	
1915	10,000.00	9,665.75	637.42	
1916	10,000.00	9,994.39	946.38	
1917	10,000.00	9,999.00	130.14	
1918	10,000.00	9,913.05	2,763.75	
1919	18,000.00	16,994.35	3,348.66	
1920	11,000.00			
Glacier:				
1911	[6] 15,000.00	14,998.59	326.88	
1912	69,200.00	69,117.94	1,490.94	
1913	75,000.00	74,568.24	4,677.14	428.84
1914	100,000.00	99,999.49	4,010.71	477.07
1915	75,000.00	74,994.27	4,218.51	9,735.44
1916	75,000.00	74,963.88	10,011.76	844.58
1917	110,000.00	108,148.16	3,202.40	1,352.75
1918	115,000.00	114,361.95	4,438.22	19,026.86
1919	80,000.00	79,729.72	2,624.53	[3]
1920	85,000.00			
1920 (deficiency)	62,000.00			
Rocky Mountain:				
1915	[7] 3,000.00	2,910.80		[8]
1916	8,000.00	7,992.84	501.93	
1917	10,000.00	9,964.24	871.27	
1918	10,000.00	9,922.10	598.75	
1919	10,000.00	9,997.60	307.50	[3]
1920	10,000.00			
Hawaii:				
1919	750.00	730.83		
1920	750.00			
Lassen Volcanic:				
1917			81.25	
1918			118.05	
Grand Canyon:				
1919			525.03	
1920	40,000.00			
Lafayette:				
1919	[9] 10,000.00	9,957.82		
1920	10,000.00			

[1] No appropriation made for the Wind Cave National Park prior to 1904.
[2] Figures not available.
[3] Expenditure of revenues for park purposes not authorized. Sundry Civil act of June 12, 1917 (40 Stat., 153).
[4] No appropriation made for the Mesa Verde National Park prior to 1907.
[5] Expenditure of revenues Mesa Verde Park for park purposes therein not authorized by statute.
[6] No appropriation made for Glacier National Park prior to 1911.
[7] No appropriation made for the Rocky Mountain National Park prior to 1915.
[8] Expenditure of revenues from Rocky Mountain Park for park purposes therein not authorized by statute.
[9] Appropriation for 1919 made under the name of Sieur de Monts National Monument.

Statements of appropriations made for, and received revenues from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Protection of national monument:				
1917	$3,500.00	$2,586.66		
1918	5,000.00	4,832.70	$225.00	
1919	10,000.00	9,163.21	320.75	
1920	8,000.00			
Casa Grande National Mounment: [1]				
1904	900.00			
1905	900.00			
1906	900.00			
1907	900.00			
1908	900.00			
1909	900.00			
1910	900.00			
1911	900.00			
1912	900.00			
1913	900.00			
1914	900.00			
1915	900.00			
1916	900.00			
1917	900.00			
1918	900.00			
1919	900.00			
Under the Smithsonian Institution:				
1907	3,000.00			
1908	3,000.00			
Improvement of Zion National Monument, Utah: 1917	15,000.00	14,963.81		
Improvement of Navajo National Monument, Ariz: 1917	[2] 3,000.00	1,962.69		

[1] Expended under the direction of the Commissioner of the General Land Office, excepting $6,000 as noted under the Smithsonian Institution.
[2] Expended under direction of Smithsonian Institution.

DETAILED STATEMENT OF APPROPRIATIONS FOR NATIONAL PARKS AND NATIONAL MONUMENTS UNDER THE JURISDICTION OF THE SECRETARY OF THE INTERIOR, 1879–1920, INCLUSIVE.

NATIONAL PARK SERVICE.[1]

1917. National Park Service in the District of Columbia, deficiency act of Apr. 17, 1917 (40 Stats., 2, 20) $3,666.67
1918. National Park Service in the District of Columbia, sundry civil act of June 12, 1917 (40 Stats., 105, 151) 17,600.00
1919. National Park Service in the District of Columbia, sundry civil act of July 1, 1918 (40 Stats., 677) 19,200.00
1920. National Park Service in the District of Columbia, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.) 22,220.00

Total 62,686.67

HOT SPRINGS RESERVATION, ARK.[2]

[From Apr. 20, 1832, to Mar. 3, 1877, no appropriations were made by Congress.]

TITLE: PROTECTION AND IMPROVEMENT, HOT SPRINGS RESERVATION.[3]

Specific appropriations by Congress from revenue fund.

1893. Improvement of Whittington Lake Reserve from proceeds of sale of lots included in above fund, 1892,[4] sundry civil act Aug. 5, 1892 (27 Stats., 373) ..... [5] $30,000.00
1896. To repay expenditures upon a sewer, 1896, act May 1, 1896 (29 Stats., 110) ..... [5] 930.00
1913. For survey for storm drainage and sanitary sewer system city of Hot Springs, abutting Hot Springs Reservation, sundry civil act of Aug. 24, 1912 (37 Stats., 457) 5,000.00

[1] Established by act of Aug. 25, 1916 (39 Stats., 535).
[2] Created by acts of Apr. 20, 1832 (4 Stats., 505); Mar. 3, 1877 (19 Stats., 377); and June 16, 1880 (21 Stats., 289).
[3] Designations given on books of Treasury Department.
[4] Years scheduled on books of Treasury Department.
[5] Without year.

1918. For the employment of a landscape engineer and such other expenses as may be required for the preparation of a practical and comprehensive plan, together with an accurate estimate of the cost thereof, for improving the Hot Springs Reservation, sundry civil act of June 12, 1917 (40 Stats., 105, 153) $10,000.00

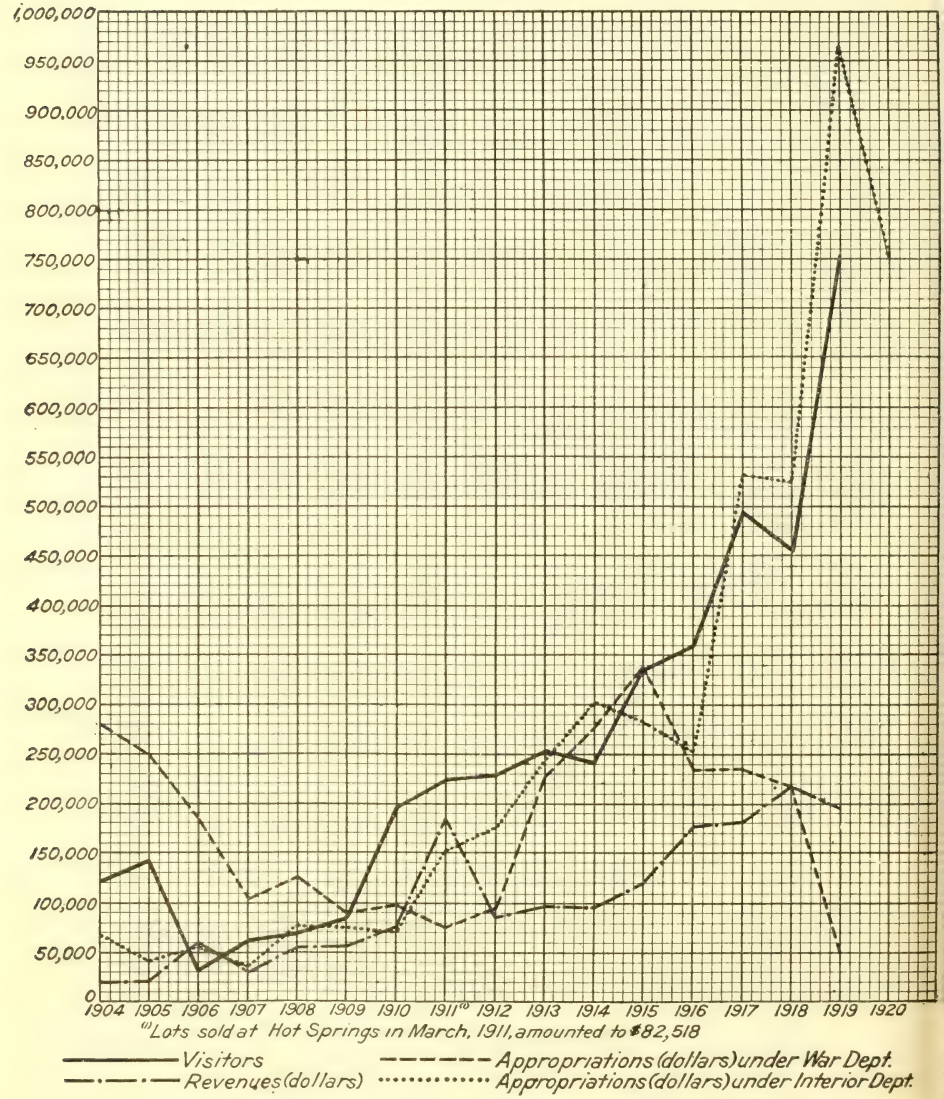


FIG. 6.—All national parks, appropriations, revenues, and visitors.

1919. For labor, material, supervision, clearing site, and all other necessary expenses incident to the construction of a new administration and Government free bathhouse building to cost not to exceed $190,000,[1] sundry civil act of July 1, 1918 (40 Stats., 679) ..... [1] 50,000.00

Total 95,930.00

[1] $140,000 from appropriations. See next page.

TITLE: IMPROVEMENT, HOT SPRINGS RESERVATION.[1]

Specific appropriation by Congress from revenue fund.

Improvement of Hot Springs Creek, 1883,[2] sundry civil act of Aug. 7, 1882 (22 Stats., 329)	[3] $33,744.78

This amount accrued to the revenue fund from operation of the bathhouses by the Court of Claims receiver in 1878.

TITLE: SALARIES AND EXPENSES, HOT SPRINGS RESERVATION.[1]

Salaries and expenses, Hot Springs Commission, 1877,[2] sundry civil act of Mar. 3, 1877 (19 Stats., 356)	[3] 27,500.00
Same as above, 1878, deficiency act of Dec. 15, 1877 (20 Stats., 12)	[3] 15,000.00
Same as above, 1879, act of Dec. 16, 1878 (20 Stats., 258)	[3] 27,500.00
Same as above, 1879, deficiency act of Mar. 3, 1879 (20 Stats., 415)	[3] 12,000.00
Total	[4] 82,000.00

TITE: PROTECTION AND IMPROVEMENT, HOT SPRINGS RESERVATION.

Specific appropriations by Congress from moneys in Treasury not otherwise appropriated.

Improvement of Hot Springs Creek, 1885,[2] sundry civil act July 7, 1884 (23 Stats., 208)	[5] $75,000.00
Same as above, 1886, sundry civil act Mar. 3, 1885 (23 Stats., 498)	[5] 8,000.00
Same as above, 1887, sundry civil act Aug. 4, 1886 (24 Stats., 239)	[5] 20,000.00
Reservoirs, pumps, piping, and improvement of the free bathhouse, sundry civil act Oct. 2, 1888 (25 Stats., 527)	[5] 36,000.00
Improvement of the free bathhouse, 1890, deficiency act Apr. 4, 1890 (26 Stats., 40)	[5] 3,200.00
For mains, pipes, pumping engine, etc., 1891, deficiency act of Sept. 30, 1890 (26 Stats., 523)	[5] 5,000.00
Construction of roads, 1892, sundry civil act of Mar. 3, 1891 (26 Stats., 972)	[5] 5,000.00
Total	152,200.00

TITLE: HOT SPRINGS RESERVATION.[1]

Specific appropriations by Congress from moneys in Treasury not otherwise appropriated.

Repairs to roads, drives, etc., and remodeling free bathhouse, 1903,[2] sundry civil act of June 28, 1902 (32 Stats., 456)	[3] $48,562.00
Repairs to roads, etc., and storage reservoir, 1904, sundry civil act of Mar. 3, 1903 (32 Stats., 1119)	[3] 30,500.00
Reimbursement of disbursing officer, 1904, deficiency act of Feb. 18, 1904 (32 Stats., 32)	[3] 500.00
Installation of electric motor for the free bathhouse, 1904, deficiency act of Apr. 27, 1904 (33 Stats., 409)	[5] 1,550.00
For gutters on mountain roads, 1905, sundry civil act of Apr. 28, 1904 (33 Stats., 486)	[5] 8,000.00
Filling lakes in Whittington Park, 1906, sundry civil act of Mar. 3, 1905 (33 Stats., 1177)	[5] 6,000.00
For labor, material, supervision, clearing site, and all other necessary expenses incident to the construction of a new administration and Government free bathhouse building to cost not to exceed $190,000,[6] sundry civil act of July 1, 1918 (40 Stats., 679)	[7] 140,000.00
Total	235,112.00

[1] Designation given on books of Treasury Department.
[2] Years scheduled on books of Treasury Department.
[3] Without year.
[4] Reimbursable from fund arising from sale of Hot Springs lots, but treated by Treasury Department as a direct appropriation.
[5] Limited to fiscal years.
[6] $50,000 from revenues; see preceding page, "Specific appropriations by Congress from revenue fund."
[7] Unexpended balance made available during 1920. Sundry civil act of July 19, 1919 (Pub. No. 21, 66th Cong.).

TITLE: CLAIMS FOR CONDEMNATION OF BUILDINGS, HOT SPRINGS RESERVATION.[1]

Specific appropriations (indefinite) from moneys in Treasury not otherwise appropriated (sundry civil act of Mar. 3, 1901).

1902[2]	[3] $26,385.45
1903	[3] 18,372.07
1904	[3] 3,500.00
1911	[3] 2,935.00
Total	51,192.52

Recapitulation of specific appropriations, 1877 to 1919, inclusive.

Titles of appropriations.	Specific appropriation from revenue fund.	Specific appropriation from Treasury.	Total.
Protection and improvement, Hot Springs Reservation	$95,930.00	$152,200.00	$248,130.00
Improvement, Hot Springs Reservation	33,744.78		33,744.78
Hot Springs Reservation		235,112.00	235,112.00
Salaries and expenses, Hot Springs Reservation		82,000.00	82,000.00
Claims for condemnation of buildings, Hot Springs Reservation		51,192.52	51,192.52
Total	129,674.78	520,504.52	650,179.30

YELLOWSTONE NATIONAL PARK, WYO.[4]

UNDER INTERIOR DEPARTMENT.

[From Mar. 1, 1872, to June 20, 1878, no annual appropriations for the park were made by Congress. See below for some of the expenses for such period paid by later appropriation acts.]

1879. Protection and improvement of the park, sundry civil act of June 20, 1878 (20 Stats., 229)	$10,000.00
1880. Protection and improvement of the park, sundry civil act of Mar. 3, 1879 (20 Stats., 393)	10,000.00
1881. Protection and improvement of the park, sundry civil act of June 16, 1880 (21 Stats., 273)	15,000.00
1882. Protection and improvement of the park, sundry civil act of Mar. 3, 1881 (21 Stats., 451)	15,000.00
1880. For deficiency on account of protection and improvement, fiscal year 1880, deficiency act of Mar. 3, 1881 (21 Stats., 421)	89.76
1883.[5] Protection and improvement of the park, sundry civil act of Aug. 7, 1882 (22 Stats., 329)	15,000.00
1879.[5] Protection and improvement of the park, deficiency act of Aug. 5, 1882 (22 Stats., 276)	150.00
1877–78. For salary and expenses of Supt. Norris from Apr. 18, 1877, to June 30, 1878, sundry civil act of Aug. 7, 1882 (22 Stats., 329)	3,180.41
1884. Protection and improvement, including salary of superintendent, $2,000, and 10 assistants at $900 each, sundry civil act of Mar. 3, 1883 (22 Stats., 626)	40,000.00
1885. Protection and improvement of the park, including salaries, sundry civil act of July 7, 1884 (23 Stats., 211)	40,000.00
1886. Protection and improvement of the park, including salaries, sundry civil act of Mar. 3, 1885 (23 Stats., 499)	40,000.00

[1] Designations given on books of Treasury Department.
[2] Years scheduled on books of Treasury Department.
[3] Without year.
[4] Created by act of Mar. 1, 1872, secs. 2474 and 2475, Rev. Stats.
[5] And prior years.

1886. Continuation of compensation, superintendent and employees, July 1 to 15, 1886, joint resolutions of July 1 and 15, 1886 (24 Stats., 343 and 345)	$934.25
Reimbursement for expense of quarters of late Supt. Conger, deficiency act of Sept. 30, 1890 (26 Stats., 523)	169.37
1887. Protection and improvement of the park (construction of roads and bridges under direction engineer officer detailed by Secretary of War), sundry civil act of Aug. 4, 1886 (24 Stats., 240)	20,000.00
1894. For office of United States commissioner and jail, act of May 7, 1894, to protect birds and punish crimes in the park (28 Stats., 75)	5,000.00
1895. Reimbursement of United States commissioner the amount paid for completion office and jail building, sundry civil act of Mar. 2, 1895 (28 Stats., 945)	385.75
1902. Repairs to United States commissioner's building, sundry civil act of Mar. 3, 1901 (31 Stats., 1162)	450.00
1902.[1] Administration and protection, sundry civil act of Mar. 3, 1901 (31 Stats., 1169)	5,000.00
1902.[2] Surveying northern and western boundaries, sundry civil act of Mar. 3, 1901 (31 Stats., 1160)	3,300.00
1903.[2] Administration and protection, sundry civil act of June 28, 1902 (32 Stats., 456)	5,000.00
Completion survey of eastern boundary, sundry civil act of June 28, 1902 (32 Stats., 456)	2,800.00
For payment to E. F. Stahle for survey of western boundary, deficiency act of July 1, 1902 (32 Stats., 573)	13.99
For payment to E. F. Stahle for additional allowance for surveying boundary, deficiency act of July 1, 1902 (32 Stats., 573)	313.71
Purchase of buffalo and providing corral and feed, deficiency act of July 1, 1902 (32 Stats., 574)	15,000.00
Payment to the State of Wyoming for protection of park in prior years, act of May 27, 1902 (32 Stats., 236)	7,780.44
1904.[2] Administration and protection (including $2,500 for maintenance of buffalo), sundry civil act of Mar. 3, 1903 (32 Stats., 1119)	7,500.00
Surveying boundaries, deficiency act of Feb. 8, 1904 (33 Stats., 32)	1,440.30
1905.[2] Administration and protection (including $2,500 for maintenance of buffalo), sundry civil act for Apr. 28, 1904 (33 Stats., 487)	7,500.00
1906.[2] Administration and protection (including $2,500 for maintenance of buffalo), sundry civil act of Mar. 3, 1905 (33 Stats., 1188)	7,500.00
1907.[2] Administration and protection (including $2,500 for maintenance of buffalo), sundry civil act of June 30, 1906 (34 Stats., 729)	7,500.00
1908.[2] Administration and protection (including $2,500 for maintenance of buffalo), sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	8,000.00
1909.[2] Administration and protection (including $2,500 for maintenance of buffalo, and $2,500 for surveying and marking unmonumented portions of park boundaries), sundry civil act of May 27, 1908 (35 Stats., 351)	10,500.00
1910.[2] Administration and protection (including $2,500 for maintenance of buffalo), sundry civil act of Mar. 4, 1909 (35 Stats., 990)	8,000.00
1911.[2] Administration and protection (including $3,000 for maintenance of buffalo), sundry civil act of June 25, 1910 (36 Stats., 745)	8,500.00

[1] Protection and improvement appropriations for the years 1888 to 1901, inclusive, were expended by the War Department.

[2] Improvement appropriations of these years were expendable by the War Department.

1912.[1] Administration and protection (including $3,000 for maintenance of buffalo), sundry civil act of Mar. 4, 1911 (36 Stats., 1420)	$8,500.00
1913.[1] Administration and protection (including $3,000 for maintenance of buffalo), sundry civil act of Aug. 24, 1912 (37 Stats., 460)	8,500.00
1914.[1] Administration and protection (including $3,000 for maintenance of buffalo), sundry civil act of June 23, 1913 (38 Stats., 49)	8,500.00
1915.[1] Administration and protection (including $3,000 for maintenance of buffalo), sundry civil act of Aug. 1, 1914 (38 Stats., 648)	8,500.00
1916.[1] Administration and protection (including $3,000 for maintenance of buffalo), sundry civil act of Mar. 3, 1915 (38 Stats., 862)	8,500.00
1917.[1] Administration and protection (including $3,000 for mainnance of buffalo), sundry civil act of July 1, 1916 (39 Stats., 307)	8,500.00
1918.[1] Administration and protection (including $5,000 for maintenance of buffalo), sundry civil act of June 12, 1917 (40 Stats., 105, 151)	10,500.00
1919. Administration, protection, maintenance, and improvement (including $15,000 for maintenance of roads leading to park gateways through forest reserves east and south, $25,000 for repair of damage caused by flood waters to road leading through east forest reserve and park to Lake Hotel, $15,400 for widening approach roads, and $50,000 for a new road around the Gardiner Slide), sundry civil act of July 1, 1918 (40 Stats., 677-678)	334,920.00
1919. Resurfacing and finishing the belt line with oil macadam, the unexpended balance of the appropriation for the fiscal year 1918, under the War Department, made available for the fiscal year 1919, under the Interior Department, sundry civil act of July 1, 1918 (40 Stats., 678)	3,259.48
1920. Administration, protection, maintenance, and improvement (including $15,000 for maintenance of roads leading to park gateways through forest reserves east and south, $15,000 for bridge over the Buffalo fork of Snake River), sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	255,500.00
For reimbursement of the appropriation for Yellowstone National Park for the fiscal year 1920 on account of expenditures for fighting forest fires in the park, deficiency act of Nov. 4, 1919 (Public No. 73, 66th Cong.)	25,000.00
Total	1,001,187.46

UNDER WAR DEPARTMENT.

1888. Protection and improvement, sundry civil act of Mar. 3, 1887 (24 Stats., 531)	$20,000.00
1889. Protection and improvement of park, sundry civil act of Oct. 2, 1888 (25 Stats., 534)	25,000.00
1890. Protection and improvement, sundry civil act of Mar. 2, 1889 (25 Stats., 967)	50,000.00
1891. Protection and improvement, sundry civil act of Aug. 30, 1890 (26 Stats., 398)	75,000.00
1892. Improvement of the park, sundry civil act of Mar. 3, 1891 (26 Stats., 977)	75,000.00
1893. Improvement of the park, sundry civil act of Aug. 5, 1892 (27 Stats., 376)	45,000.00
1894. Improvement of the park, sundry civil act of Mar. 3, 1893 (27 Stats., 598)	30,000.00
1895. Improvement of the park, sundry civil act of Aug. 18, 1894 (28 Stats., 403)	30,000.00

[1] Improvement appropriations of these years were expendable by the War Department.

1896.	Improvement and protection of the park, sundry civil act of Mar. 2, 1895 (28 Stats., 945)	$30,000.00
1897.	Improvement and protection, sundry civil act of June 11, 1896 (29 Stats., 442)	35,000.00
	Improvement and protection, sundry civil act of June 4, 1897 (30 Stats., 43)	35,000.00
1898.	Improvements, deficiency act of June 8, 1896 (29 Stats., 284)	5,000.00
	Improvement of the park, deficiency act of July 19, 1897 (30 Stats., 143)	.78
1899.	Improvement and protection, sundry civil act of July 1, 1898 (30 Stats., 629)	40,000.00
	Improvements, deficiency act of July 7, 1898 (30 Stats., 667)	93.75
1900.	Improvement and protection, sundry civil act of Mar. 3, 1899 (30 Stats., 1105)	40,000.00
	Improvement of the park, deficiency act of Mar. 3, 1899 (30 Stats., 1226)	99.80
1901.	Improvement and protection, sundry civil act of June 6, 1900 (31 Stats., 624)	60,000.00
	Improvement, deficiency act of June 6, 1900 (31 Stats., 291)	6.95
	Improvement for 1898, deficiency act of June 6, 1900 (31 Stats., 291)	162.62
1902.	Improvement of the park, sundry civil act of Mar. 3, 1891 (31 Stats., 1169)	113,000.00
1903.	Improvement of the park, sundry civil act of June 28, 1902 (32 Stats., 466)	250,000.00
	Payment to Northern Pacific Ry. Co. for transportation of cast-iron pipe, deficiency act of Feb. 14, 1902 (32 Stats., 12)	31.96
1904.	Improvement of the park, sundry civil act of Mar. 3, 1903 (32 Stats., 1130)	250,000.00
1905.	Improvement of the park, sundry civil act of Apr. 28, 1904 (33 Stats., 498)	250,000.00
1906.	Improvement of the park, sundry civil act of Mar. 3, 1905 (33 Stats., 1198)	133,000.00
1907.	Maintenance and repair of improvements in park, sundry civil act of June 30, 1906 (34 Stats., 743)	55,000.00
1908.	Maintenance and repair of improvements in park, sundry civil act of Mar. 4, 1907 (34 Stats., 1349)	75,000.00
1909.	Maintenance and repair of improvements in park, sundry civil act of May 27, 1908 (35 Stats., 365)	65,000.00
1910.	Maintenance and repair of improvements in park, sundry civil act of Mar. 4, 1909 (35 Stats., 1005)	65,000.00
1911.	Maintenance and repair of improvements in park, sundry civil act of June 25, 1910 (36 Stats., 725)	75,000.00
1912.	Maintenance and repair of improvements in park, sundry civil act of Mar. 4, 1911 (36 Stats., 1402)	70,000.00
	Construction of chapel in park on or near military reservation, Army appropriation act of Mar. 3, 1911 (36 Stats., 1050)	25,000.00
1913.	Maintenance and repair of improvements in park, sundry civil act of Aug. 24, 1912 (37 Stats., 442)	100,000.00
	Widening and improving surface of roads for building bridges and culverts to make roads suitable and safe for animal-drawn and motor-propelled vehicles, sundry civil act of Aug. 24, 1912 (37 Stats., 442)	77,000.00
1914.	Maintenance and repair of improvements in park, sundry civil act of June 23, 1913 (38 Stats., 33)	125,000.00
	Widening and improving surface of roads, for building bridges and culverts to make roads suitable and safe for animal-drawn and motor-propelled vehicles, sundry civil act of June 23, 1913 (38 Stats., 33)	75,000.00
1915.	Maintenance and repair of improvements, sundry civil act of Aug. 1, 1914 (38 Stats., 632)	125,000.00
	Widening to not exceeding 18 feet, and improving surface of roads, and for building bridges and culverts in the park to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, sundry civil act of Aug. 1, 1914 (38 Stats., 632)	100,000.00

1915. Widening to not exceeding 18 feet and improving the surface of roads and for building bridges and culverts *in the forest reserve* leading out of the park from the east boundary to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, sundry civil act of Aug. 1, 1914 (38 Stats., 633)	$30,000.00
1916. Maintenance and repair of improvements, sundry civil act of Mar. 3, 1915 (38 Stats., 845)	125,000.00
Widening and improving surface of roads, for building bridges and culverts to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, sundry civil act of Mar. 3, 1915 (38 Stats., 845)	50,000.00
Completing the widening to not exceeding 18 feet of roadway and improving the surface of roads and for building bridges and culverts *in the forest reserve* leading out of the park from the east boundary, to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, sundry civil act of Mar. 3, 1915 (38 Stat., 845)	20,000.00
1917. Maintenance and repair of improvements, sundry civil act of July 1, 1916 (39 Stats., 288)	152,500.00
For completing the widening to not exceeding 18 feet of roadway and improving the surface of roads and for building bridges and culverts *in the forest reserve* leading out of the park from the east boundary, sundry civil act of July 1, 1916 (39 Stats., 289)	6,000.00
Widening and improving surface of roads, for building bridges and culverts to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, sundry civil act of July 1, 1916 (39 Stats., 289)	38,700.00
1918. For maintenance and repair of improvements, sundry civil act of June 12, 1917 (40 Stats., 105, 132)	147,500.00
For resurfacing and for finishing the belt line with oil macadam, sundry civil act of June 12, 1917 (40 Stats., 105, 132)	[1] 20,000.00
Total	3,213,095.86

RECAPITULATION.

Appropriations under the Interior Department, 1879 to 1920, inclusive	1,001,187.46
Appropriations under the War Department, 1888 to 1918, inclusive	3,213,095.86
Total	4,214,283.32

SEQUOIA NATIONAL PARK, CAL.[2]

[From Sept. 25, 1890, to June 6, 1900, no appropriations for the park were made by Congress.]

1901. Protection and improvement, sundry civil act of June 6, 1900 (31 Stats., 618)	$10,000.00
1902. Protection and improvement, sundry civil act of Mar. 3, 1901 (31 Stats., 1162)	10,000.00
1903. Protection and improvement, sundry civil act of June 28, 1902 (32 Stats., 456)	10,000.00
1904. Protection and improvement, sundry civil act of Mar. 3, 1903 (32 Stats., 1119)	10,000.00
Protection and improvement, deficiency act of Mar. 3, 1903 (32 Stats., 1060)	89.69
1905. Protection and improvement, sundry civil act of Apr. 28, 1904 (33 Stats., 487)	10,000.00

[1] Unexpended balance of $3,259.48 made available for expenditure by the Secretary of the Interior for same purpose during the 1919 fiscal year. Sundry civil act of July 1, 1918 (40 Stats., 678).

[2] Created by acts of Sept. 25, 1890 (26 Stats., 478), and Oct. 1, 1890 (26 Stats., 650).

1906. Protection and improvement, sundry civil act of Mar. 3, 1905 (33 Stats., 1188)	$10,000.00
1907. Protection and improvement, sundry civil act of June 30, 1906 (34 Stats., 729)	10,000.00
1908. Protection and improvement, sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	15,550.00
1909. Protection and improvement, sundry civil act of May 27, 1908 (35 Stats., 351)	15,550.00
1910. Protection and improvement, sundry civil act of Mar 4, 1909 (35 Stats., 990)	15,550.00
1911. Protection and improvement, sundry civil act of June 25, 1910 (36 Stats., 745)	15,550.00
1912. Protection and improvement, construction and repair of bridges, fences, and trails, sundry civil act of Mar. 4, 1911 (36 Stats., 1421)	15,550.00
1913. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	15,550.00
1914. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of June 23, 1913 (38 Stats., 49)	15,550.00
1915. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, including the purchase of site for ranger station not to exceed $500, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	15,550.00
1916. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, including the purchase of site for ranger station not to exceed $500, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	15,550.00
1917. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of July 1, 1916 (39 Stats., 308)	22,300.00
Purchase of lands in Sequoia National Park, sundry civil act of July 1, 1916 (39 Stats., 308)	50,000.00
1918. For protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	25,000.00
1919. For protection and improvement, including not exceeding $12,000 for a bridge at old Marble Fork Bridge site, sundry civil act of July 1, 1918 (40 Stats., 678)	30,510.00
1920. Protection and improvement, construction and repair of bridges, fences, and trails, improvement of roads other than toll roads, sundry civil act of July 12, 1919 (Public No. 21, 66th Cong.)	35,000.00
Total	372,849.69

YOSEMITE NATIONAL PARK, CALIF.[1]

[From Oct. 1, 1890, to July 1, 1898, no appropriations for the park were made by Congress.]

1899. For improvement, sundry civil act of July 1, 1898 (30 Stats., 624)	$4,000.00
1900. For improvement, sundry civil act of Mar. 3, 1899 (30 Stats., 1100)	4,000.00
1901. Protection and improvement, sundry civil act of June 6, 1900 (31 Stats., 618)	4,000.00
1902. Protection and improvement, sundry civil act of Mar. 3, 1901 (31 Stats., 1162)	4,000.00

[1] Created by act of Oct. 1, 1890 (26 Stats., 650); boundaries changed by act of Feb. 7, 1905 (33 Stats., 702), and joint resolution of June 11, 1906 (34 Stats., 831), the latter accepting recession of Yosemite Valley from the State of California.

1903. Protection and improvement, sundry civil act of June 28, 1902 (32 Stats., 456)	$6,000.00
Payment of expenses incurred by officer detailed from Sequoia Park to Yosemite Park for investigation, deficiency act of Mar. 3, 1903 (32 Stats., 1060)	49.25
1904. Protection and improvement, sundry civil act of Mar. 3, 1903 (32 Stats., 1119)	6,000.00
1905. Protection and improvement, sundry civil act of Apr. 28, 1904 (33 Stats., 487)	5,400.00
Yosemite Park Lands Commission, for examination of conditions, etc., to ascertain what parts not necessary for park purposes, and determine course proposed road to Yosemite Valley, sundry civil act of Apr. 28, 1904 (33 Stats., 487)	3,000.00
1906. Protection and improvement, sundry civil act of Mar. 3, 1905 (33 Stats., 1188)	5,400.00
Management, protection, and improvement, joint resolution of Mar. 3, 1905 (33 Stats., 1286)	20,000.00
1907. Protection and improvement, sundry civil act of June 30, 1906 (34 Stats., 729)	5,750.00
1908. Protection and improvement, sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	30,000.00
1909. Protection and improvement, sundry civil act of May 27, 1908 (35 Stats., 351)	30,000.00
1910. Protection and improvement, sundry civil act of Mar. 4, 1909 (35 Stats., 990)	30,000.00
1911. Protection and improvement, sundry civil act of June 25, 1910 (36 Stats., 745)	62,000.00
For examination of water supply in the Yosemite National Park for the city of San Francisco, sundry civil act of June 25, 1910 (36 Stats., 745)	12,000.00
1912. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of Mar. 4, 1911 (36 Stats., 1420)	50,000.00
1913. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	80,000.00
1914. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of June 23, 1913 (38 Stats., 49)	125,000.00
1915. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	100,000.00
1916. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, including not exceeding $2,700 for maintenance and repair of horse-drawn passenger-carrying vehicles, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	75,000.00
1916. To cover claim of Crane Co. for water-system supplies as reported in House Document 1579, Sixty-third Congress, third session, deficiency act of Mar. 4, 1915 (38 Stats., 1157)	196.80
1917. Protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, including not exceeding $500 for maintenance and repair of horse-drawn passenger-carrying vehicles, not exceeding $75,000 for grading in width not exceeding 20 feet El Portal-Yosemite road, and not exceeding $150,000 for installation of a hydroelectric power plant, sundry civil act of July 1, 1916 (39 Stats., 308)	250,000.00

1918.	For protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads, including $8,000 for a bridge at the old Sentinel Bridge site, and not exceeding $75,000 for grading in width not exceeding 20 feet El Portal-Yosemite road; also not exceeding $60,000 for the completion of the installation of the hydroelectric power plant authorized by the sundry civil act for the fiscal year 1917, sundry civil act of June 12, 1917 (40 Stats., 105, 152); in all	$235,000.00
1919.	For protection and improvement, including $15,000 for new bridge on Sentinel Bridge site and $75,000 for continuing reconstruction of El Portal-Yosemite road, sundry civil act of July 1, 1918 (40 Stats., 678)	255,000.00
1920.	Protection and improvement, including $55,000 for continuing reconstruction of El Portal-Yosemite road, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	200,000.00
	Total	1,601,796.05

Specific appropriations by Congress from the revenue fund of Yosemite Park.

1918.	For completion of the installation of the hydroelectric power plant, deficiency act of Mar. 28, 1918 (40 Stats., 491)	$3,500.00

GENERAL GRANT NATIONAL PARK, CALIF.[1]

[From Oct. 1, 1890, to June 6, 1900, no appropriations for the park were made by Congress.]

1901.	Improvement of park, sundry civil act of June 6, 1900 (31 Stats., 618)	$2,500.00
1902.	Protection and improvement, sundry civil act of Mar. 3, 1901 (31 Stats., 1162)	2,500.00
1903.	Protection and improvement, sundry civil act of June 28, 1902 (32 Stats., 456)	2,500.00
1904.	Protection and improvement, sundry civil act of Mar. 3, 1903 (32 Stats., 1119)	2,000.00
	For improvement of park in 1901, deficiency act of Mar. 3, 1903 (32 Stats., 1060)	58.65
1905.	Protection and improvement, sundry civil act of Apr. 28, 1904 (33 Stats., 487)	2,000.00
1906.	Protection and improvement, sundry civil act of Mar. 3, 1905 (33 Stats., 1188)	2,000.00
1907.	Protection and improvement, sundry civil act of June 30, 1906 (34 Stats., 729)	2,000.00
1908.	Protection and improvement, sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	2,000.00
1909.	Protection and improvement, sundry civil act of May 27, 1908 (35 Stats., 351)	2,000.00
1910.	Protection and improvement, sundry civil act of Mar. 4, 1909 (35 Stats., 990)	2,000.00
1911.	Protection and improvement, sundry civil act of June 25, 1910 (36 Stats., 745)	2,000.00
1912.	Protection and improvement, sundry civil act of Mar. 4, 1911 (36 Stats., 1421)	2,000.00
1913.	Protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	2,000.00
1914.	Protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of June 23, 1913 (38 Stats., 49)	2,000.00
1915.	Protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	2,000.00

[1] Created by act of Oct. 1, 1890 (26 Stats., 650).

1916. Protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of Mar. 3, 1915 (38 Stat., 863)	$2,000.00
1917. Protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of July 1, 1916 (39 Stats., 308)	2,000.00
1918. For protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	2,000.00
1919. For protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of July 1, 1918 (40 Stat., 678)	4,500.00
1920. Protection and improvement, construction of fences and trails, and repairing and extension of roads, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	6,000.00
Total	48,058.65

MOUNT RAINIER NATIONAL PARK, WASH.[1]

UNDER INTERIOR DEPARTMENT.

[From Mar. 2, 1899, to June 30, 1906, no appropriations for the park were made by Congress.]

1907. Protection and improvement, sundry civil act of June 30, 1906 (34 Stats., 729)	$2,500.00
1908. Protection and improvement, sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	3,000.00
1909. Protection and improvement, sundry civil act of May 27, 1908 (35 Stats., 351)	3,000.00
1910. Protection and improvement, sundry civil act of Mar. 4, 1909 (35 Stats., 991)	3,000.00
1911. Protection and improvement, sundry civil act of June 25, 1910 (36 Stats., 745)	3,000.00
1912. Protection and improvement, construction of bridges, fences, and trails, etc., sundry civil act of Mar. 4, 1911 (36 Stats., 1421)	[2]5,000.00
1913. Protection and improvement, construction of bridges, fences, and trails, and improvement of roads, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	20,000.00
1914. Protection and improvement, construction of bridges, fences, and trails, and improvement of roads, sundry civil act of June 23, 1913 (38 Stats., 50)	13,400.00
For survey for the extension of the present road from a point at or about Longmire Springs eastward to the eastern boundary line of the forest reserve surrounding the park and for survey of necessary trails, sundry civil act of June 23, 1913 (38 Stats., 50)	10,000.00
1915. Protection and improvement, construction of bridges, fences, and trails, and improvement of roads, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	51,000.00
1916. Protection and improvement, construction of bridges, fences, and trails, and improvement of roads, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	30,000.00
1917. Protection and improvement, construction of bridges, fences, and trails, and improvement of roads, sundry civil act of July 1, 1916 (39 Stats., 308)	30,000.00
1918. Protection and improvement, construction of roads, bridges, fences, and trails, and improvement of roads, including not exceeding $1,250 for the purchase of a motor-driven vehicle and the maintenance and repair thereof, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	75,000.00

[1] Created by act of Mar. 2, 1899 (30 Stats., 993).
[2] By the act of Aug. 14, 1911 (37 Stats., 38), the above-mentioned appropriation was reduced to $5,000.

1919. For protection and improvement, construction of roads, bridges, fences, and trails, and improvement of roads, sundry civil act of July 1, 1918 (40 Stats., 678)	$24,600.00
1920. Protection and improvement, construction of roads, bridges, fences, trails, and improvement of roads, sundry civil act of July 12, 1919 (Public No. 21, 66th Cong.)	32,500.00
Total	306,000.00

UNDER WAR DEPARTMENT.

1903. Survey of most practicable route for wagon road into park and toward construction of said road after survey shall have been made, deficiency act of Mar. 3, 1903 (32 Stats., 1131)	$10,000.00
1904. Continuing construction wagon road, sundry civil act of Apr. 28, 1904 (33 Stats., 498)	30,000.00
1906. Continuing construction wagon road, sundry civil act of June 30, 1906 (34 Stats., 744)	50,000.00
1907. Continuing construction wagon road, sundry civil act of Mar. 4, 1907 (34 Stats, 1349)	50,000.00
1908. Continuing construction wagon road, sundry civil act of May 27, 1908 (35 Stats., 365)	50,000.00
1909. Completion of wagon road, sundry civil act of Mar. 4, 1909 (35 Stats., 1005)	25,000.00
1910. Additional work upon wagon road, sundry civil act of June 25, 1910 (36 Stats., 725)	25,000.00
Total	240,000.00

RECAPITUATION.

Appropriations under the Interior Department, 1907 to 1920, inclusive	306,000.00
Appropriations expended under the War Department, 1903 to 1910, inclusive	240,000.00
Total	546,000.00

CRATER LAKE NATIONAL PARK, OREG.[1]

UNDER INTERIOR DEPARTMENT.

1902 and 1903. Protection and improvement, deficiency act of July 1, 1902 (32 Stats., 571)	$2,000.00
1904. Protection and improvement, sundry civil act of Mar. 3, 1903 (32 Stats., 1119)	2,000.00
1905. Protection and improvement, sundry civil act of Apr. 28, 1904 (33 Stats., 487)	3,000.00
1906. Protection and improvement, sundry civil act of Mar. 3, 1905 (33 Stats., 1188)	3,000.00
1907. Protection and improvement, sundry civil act of June 30, 1906 (34 Stats., 729)	3,000.00
1908. Protection and improvement, sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	7,315.00
1909. Protection and improvement, sundry civil act of May 27, 1908 (35 Stats., 351)	3,000.00
1910. Protection and improvement, sundry civil act of Mar. 4, 1909 (35 Stats., 990)	3,000.00
1911. Protection and improvement, sundry civil act of June 25, 1910 (36 Stats., 745)	3,000.00
1912. Protection and improvement, sundry civil act of Mar. 4, 1911 (36 Stats., 1421)	3,000.00
1913. Protection and improvement, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	3,000.00

[1] Created by act of May 22, 1902 (32 Stat., 202).

1914. Protection and improvement and repairing and extension of roads, sundry civil act of June 23, 1913 (38 Stats., 50)	$7,540.00
1915. Protection and improvement and repairing and extension of roads, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	8,040.00
1916. Protection and improvement and repairing and extension of roads, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	8,000.00
1917. Protection and improvement and repairing and extension of roads, sundry civil act of July 1, 1916 (39 Stats., 308)	8,000.00
1918. Protection and improvement and repairing and extension of roads, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	15,000.00
1919. For protection and improvement and repairing and extension of roads, sundry civil act of July 1, 1918 (40 Stats., 679)	13,225.00
1920. Protection and improvement and repairing and extension of roads, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	28,225.00
Total	123,345.00

UNDER WAR DEPARTMENT.

1910. Surveying, locating, and preparing plans and estimates for roads and trails in the park, sundry civil act of June 25, 1910 (36 Stats., 725)	$10,000.00
1913. Construction of wagon road and necessary bridges through park, with system of tanks and water-supply pipes for sprinkling, sundry civil act of Aug. 24, 1912 (37 Stats., 443)	50,000.00
1914. Continuation of the construction of a wagon road and the necessary bridges through park, with system of tanks and water-supply pipes for sprinkling, sundry civil act of June 23, 1913 (38 Stats., 33)	75,000.00
1915. Continuation of the construction of a wagon road and the necessary bridges through park, with system of tanks and water-supply pipes for sprinkling, sundry civil act of Aug. 1, 1914 (38 Stats., 633)	85,000.00
1916. Continuation of the construction of a wagon road and the necessary bridges through park, with system of tanks and water-supply pipes for sprinkling, sundry civil act of Mar. 3, 1915 (38 Stats., 845)	50,000.00
1917. Continuation of the construction of a wagon road and the necessary bridges through park, with system of tanks and water-supply pipes for sprinkling, also for maintenance, repair, and operation of two horse-drawn passenger-carrying vehicles, sundry civil act of July 1, 1916 (39 Stats., 289)	50,000.00
1918. For continuation of a wagon road and the necessary bridges through the park, together with a system of tanks and water-supply pipes for sprinkling (H. Doc. 328, 62d Cong., 2d sess.), and for maintenance, repair, and operation of two horse-drawn passenger-carrying vehicles, sundry civil act of June 12, 1917 (40 Stats., 105, 132)	50,000.00
1919. For construction and maintenance of a wagon road and the necessary bridges through the park, together with a system of tanks and water-supply pipes for sprinkling, sundry civil act of July 1, 1918 (40 Stats., 658)	50,000.00
Total	420,000.00

RECAPITULATION.

Appropriations under the Interior Department, 1902 to 1920, inclusive	123,345.00
Appropriations expended under the War Department, 1910 to 1919, inclusive	420,000.00
Total	543,345.00

PLATT NATIONAL PARK [1] (formerly Sulphur Springs Reservation), OKLA.

[From July 1, 1902, to June 25, 1910, no appropriations for the park were made by Congress.]

1909 and 1910. Appropriation of $16,000 for certain specified improvements out of park-revenue fund. This was ineffective, as the revenue-fund balance was only sufficient to carry a reduced force of employees for the proper protection of the park, sundry civil act of Mar. 4, 1909 (35 Stats., 991).	
1911. Care and maintenance, including all personal services, sundry civil act of June 25, 1910 (36 Stats., 745)	$5,000.00
1912. Maintenance, bridging, roads, trails, and sewerage, sundry civil act of Mar. 4, 1911 (36 Stats., 1420)	10,000.00
1913. Maintenance, bridging, roads, and trails, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	8,000.00
1913. Construction sanitary sewer (contingent on city of Sulphur, Okla., appropriating a similar sum), Indian appropriation act of Aug. 24, 1912 (37 Stats., 532)	17,500.00
1914. Maintenance, bridging, roads, and trails, deficiency appropriation act of Oct. 22, 1913 (38 Stats., 218)	8,000.00
1915. Maintenance, bridging, roads, and trails, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	8,000.00
1916. Maintenance, bridging, roads, and trails, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	8,000.00
To cover the cost of repairing damage to bridges, roads, trails, buildings, etc., deficiency appropriation act of Mar. 31, 1916 (39 Stats., 42)	10,000.00
1917. For improvement and protection, sundry civil act of July 1, 1916 (39 Stats., 308)	8,000.00
1918. For improvement and protection, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	7,180.00
1919. For improvement and protection, sundry civil act of July 1, 1918 (40 Stats., 679)	7,500.00
1920. For improvement and protection, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	6,000.00
Total	103,180.00

WIND CAVE NATIONAL PARK, S. DAK.[2]

1904. Protection and improvement, sundry civil act of Mar. 3, 1903 (32 Stats., 1119)	$2,500.00
1905. Protection and improvement, sundry civil act of Apr. 28, 1904 (33 Stats., 487)	2,500.00
1906. Protection and improvement, sundry civil act of Mar. 3, 1905 (33 Stats., 1188)	2,500.00
1907. Protection and improvement, sundry civil act of June 30, 1906 (34 Stats., 729)	4,400.00
1908. Protection and improvement, sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	2,500.00
1909. Protection and improvement, sundry civil act of May 27, 1908 (35 Stats., 352)	2,500.00
1910. Protection and improvement, sundry civil act of Mar. 4, 1909 (35 Stats., 991)	2,500.00
1911. Protection and improvement, sundry civil act of June 25, 1910 (36 Stats., 745)	2,500.00
1912. Management, improvement, and protection, sundry civil act of Mar. 4, 1911 (36 Stats., 1421)	2,500.00
1913. No appropriation made.	
1914. Improvement and protection, sundry civil act of June 23, 1913 (38 Stats., 50)	2,500.00
1915. Protection and improvement, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	2,500.00

[1] Created by acts of July 1, 1902 (32 Stats., 641), and Apr. 21, 1904 (33 Stats., 220); name changed by joint resolution of June 29, 1906 (34 Stats., 837).
[2] Created by act of Jan. 9, 1903 (32 Stats., 765).

1916. Protection and improvement, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	$2,500.00
1917. Protection and improvement, sundry civil act of July 1, 1916 (39 Stats., 308)	2,500.00
1918. For improvement and protection, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	2,500.00
1919. For improvement and protection, sundry civil act of July 1, 1918 (40 Stats., 679)	4,000.00
1920. For improvement and protection, sundry civil act of July 19, 1919 (Public No. 21, 66th Congress)	4,000.00
Total	44,900.00

UNDER DEPARTMENT OF AGRICULTURE.[1]

1913. For the establishment of a national game preserve, to be known as the Wind Cave National Game Preserve, upon the land embraced within the boundaries of the Wind Cave National Park, in the State of South Dakota, for a permanent national range for a herd of buffalo to be presented to the United States by the American Bison Society, and for such other native American game animals as may be placed therein. The Secretary of Agriculture is authorized to acquire by purchase or condemnation such adjacent lands as may be necessary for the purpose of assuring an adequate permanent water supply, and to inclose the said game preserve with a good and substantial fence and to erect thereon all necessary sheds and buildings for the proper care and maintenance of the said animals, to be available until expended, Agricultural act of August 10, 1912 (37 Stats., 293)	$26,000.00

RECAPITULATION.

Appropriations under the Interior Department, 1904 to 1920, inclusive	44,900.00
Appropriation expended under the Department of Agriculture, appropriated for the fiscal year 1913 and made available until expended	26,000.00
Total	70,900.00

SULLYS HILL PARK, N. DAK.[2]

UNDER THE DEPARTMENT OF THE INTERIOR.

[From June 2, 1904, to June 30, 1913, no appropriations for the park were made by Congress.]

1914. For examination of the land embraced in Sullys Hill Park to determine whether it contains valuable minerals, Indian appropriation act of June 30, 1913 (38 Stats., 92)	$500.00

UNDER DEPARTMENT OF AGRICULTURE.

1915. For the improvement of the game preserve in the park, Agricultural appropriation act of June 30, 1914 (38 Stats., 434)	$5,000.00
1916. For the improvement of the game preserve in the park, including construction of fences, sheds, buildings, corrals, roads, and other structures which may be necessary, Agricultural appropriation act of Mar. 4, 1915 (38 Stats., 1105)	5,000.00

[1] Funds for the maintenance and further improvement of this game preserve are allotted each year from lump-sum appropriations for the Biological Survey, Department of Agriculture.

[2] Created by Executive proclamation of June 2, 1904, under the act approved Apr. 27, 1904 (33 Stats., 319).

1917.	For the improvement of the game preserve in the park, including construction of fences, sheds, buildings, corrals, roads, and other structures which may be necessary, Agricultural appropriation act of Aug. 11, 1916 (39 Stats., 467)	$5,000.00
1918.	For the maintenance and improvement of the game preserves in Sullys Hill National Park, including the construction of all fences, sheds, buildings, corrals, roads, and other structures which may be necessary, in addition to the amount heretofore appropriated, available until expended, Agricultural appropriation act of Mar. 4, 1917 (39 Stats., 1155)	5,000.00
	Total	20,000.00

RECAPITULATION.

	Appropriations under the Interior Department, fiscal year 1914	500.00
	Appropriations expended under the Department of Agriculture, 1914 to 1918, inclusive	20,000.00
	Total	20,500.00

MESA VERDE NATIONAL PARK, COLO.[1]

1908.	Protection and improvement, sundry civil act of Mar. 4, 1907 (34 Stats., 1337)	$7,500.00
1909.	Protection and improvement, sundry civil act of May 27, 1908 (35 Stats., 351)	7,500.00
1910.	Protection and improvement, sundry civil act of Mar. 4, 1909 (35 Stats., 990)	7,500.00
1911.	Protection and improvement, inclusive of $12,500 reserved within appropriation for construction of main wagon road through the park, sundry civil act of June 25, 1910 (36 Stats., 745)	20,000.00
	For examination and leasing, etc., of coal lands in the park, deficiency act of June 25, 1910 (36 Stats., 796)	2,000.00
1912.	Protection and improvement, sundry civil act of Mar. 4, 1911 (36 Stats., 1421)	7,500.00
1913.	Protection and improvement, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	15,000.00
1914.	Protection and improvement, sundry civil act of June 23, 1913 (38 Stats., 50)	10,000.00
1915.	Protection and improvement, sundry civil act of Aug. 1, 1914 (38 Stats., 649)	10,000.00
1916.	Protection and improvement, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	10,000.00
1917.	Protection and improvement, sundry civil act of July 1, 1916 (39 Stats., 308)	10,000.00
1918.	Protection and improvement, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	10,000.00
1919.	For protection and improvement, sundry civil act of July 1, 1918 (40 Stats., 678–9)	18,000.00
1920.	Protection and improvement, sundry civil act of July 19, 1919 (Public, No. 21, 66th Cong.)	11,000.00
	Total	146,000.00

GLACIER NATIONAL PARK, MONT.[2]

1911.	For improvement of Glacier National Park, the construction and repair of roads and trails, sundry civil act of June 25, 1910 (36 Stats., 745)	$15,000.00

[1] Created by act of June 29, 1906 (34 Stats., 616).
[2] Created by act of Congress approved May 11, 1916 (36 Stats., 354).

1912. For administration and improvement, construction of roads, bridges, telephone lines, and repair of roads, trails, and bridges (appropriation made immediately available), sundry civil act of Mar. 4, 1911 (36 Stat., 1421)	$69,200.00
1913. For administration and improvement, construction of roads, bridges, telephone lines, and repair of roads, trails, and bridges, sundry civil act of Aug. 24, 1912 (37 Stats., 460)	75,000.00
1914. For administration and improvement, construction and repair of roads, bridges, and telephone lines, sundry civil act of June 23, 1913 (38 Stats., 49)	100,000.00
1915. For administration and improvement, construction and repair of roads, trails, bridges, and telephone lines, sundry civil act of Aug. 1, 1914 (38 Stats., 648–649)	75,000.00
1916. For administration and improvement, construction and repair of roads, trails, bridges, and telephone lines, sundry civil act of Mar. 3, 1915 (38 Stats., 862–863)	75,000.00
1917. For administration and improvement, construction and repair of roads, trails, bridges, and telephone lines, including $10,000 reimbursement to Great Northern Railway Co. for repair of 32 miles of roads in the Blackfeet Indian Reservation, sundry civil act of July 1, 1916 (39 Stats., 307–308)	110,000.00
1918. For administration and improvement, construction and repair of roads, trails, bridges, and telephone lines, including necessary repairs to the roads from Glacier Park station through the Blackfeet Indian Reservation to various points in the boundary line of the park, and for the purchase and maintenance of horse-drawn and motor-driven passenger-carrying vehicles for the use of the supervisor and employees in connection with general park work, sundry civil act of June 12, 1917 (40 Stats., 105, 151)	115,000.00
1919. For administration and improvement, including necessary repairs to the roads from Glacier Park station through the Blackfeet Indian Reservation to various points in the boundary line of Glacier National Park, sundry civil act of July 1, 1918 (40 Stats., 678)	80,000.00
1920. For administration and improvement, including necessary repairs to the roads from Glacier Park station through the Blackfeet Indian Reservation to various points in the boundary line of Glacier National Park, sundry civil act of July 19, 1919 (Public, No. 21, 66th Cong.)	85,000.00
For reimbursement of the appropriation for Glacier National Park for fiscal year 1920 on account of expenditures for fighting forest fires in the park, $50,000; for construction of a bridge over Flathead River at Belton, Mont., $12,000; deficiency act of Nov. 4, 1919 (Public No. 73, 66th Cong)	62,000.00
Total	799,200.00

ROCKY MOUNTAIN NATIONAL PARK.[1]

1915. For protection and improvement, deficiency appropriation act of Mar. 4, 1915 (38 Stats., 1148)	$3,000.00
1916. For protection and improvement, sundry civil act of Mar. 3, 1915 (38 Stats., 863)	8,000.00
1917. For protection and improvement, sundry civil act of July 1, 1916 (39 Stats., 308)	10,000.00
1918. For protection and improvement, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	10,000.00
1919. For protection and improvement, sundry civil act of July 1, 1918 (40 Stats., 679)	10,000.00
1920. Protection and improvement, sundry civil bill of July 19, 1919 (Public No. 21, 66th Cong.)	10,000.00
Total	51,000.00

[1] Created by act of Jan. 20, 1915 (38 Stats., 798).

HAWAII NATIONAL PARK, HAWAII.[1]

1919. For expenses incident to securing donations of patented lands and rights of way over patented lands in Hawaii National Park, sundry civil act of July 1, 1918 (40 Stats., 679)	$750.00
1920. For expenses incident to securing donations of patented lands and rights of way over patented lands in Hawaii National Park, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	750.00
Total	1,500.00

GRAND CANYON NATIONAL PARK, ARIZ.[2]

1920. Administration, protection, maintenance, improvement, and development, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	$40,000.00

LAFAYETTE NATIONAL PARK, ME.[3]

1919. Protection and improvement, including not exceeding $1,400 for purchase, maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for use of rangers in administration of the monument, sundry civil act approved July 1, 1918 (40 Stats., 679)	[4] 10,000.00
1920. Administration, maintenance, protection, and improvement, sundry civil act approved July 19, 1919 (Public No. 21, 66th Cong.)	10,000.00
Total	20,000.00

National parks, listed by name and date of creation, for which no appropriations have been made since the date of their establishment: Lassen Volcanic, August 9, 1916 (39 Stats., 442). Mount McKinley, February 26, 1917 (39 Stats., 938).

NATIONAL MONUMENTS.[5]

ADMINISTERED UNDER THE SUPERVISION OF THE SECRETARY OF THE INTERIOR.

[Prior to the fiscal year 1917 no appropriations were made by Congress for the national monuments.]

National Monuments, General.

1917. Protection of national monuments: For the preservation, development, administration, and protection, sundry civil act of July 1, 1916 (39 Stats., 309)	$3,500.00
1918. For the preservation, development, administration, and protection of the national monuments, sundry civil act of June 12, 1917 (40 Stats., 105, 152)	5,000.00
1919. For the preservation, development, administration, and protection of the national monuments, sundry civil act of July 1, 1918 (40 Stats., 679)	10,000.00
1920. For the preservation, development, administration, and protection of the national monuments, sundry civil act of July 19, 1919 (Public No. 21, 66th Cong.)	8,000.00
Total	26,500.00

[1] Created by act of Congress approved Aug. 1, 1916 (39 Stats., 432).
[2] Created by act of Feb. 26, 1919 (40 Stats., 1175).
[3] Created by act of Feb. 26, 1919 (40 Stats., 1178).
[4] Appropriated under the name of Sieur de Monts National Monument.
[5] Set apart from public domain under act of June 8, 1906 (34 Stats., 225).

CASA GRANDE NATIONAL MONUMENT, ARIZ.[1]

UNDER INTERIOR DEPARTMENT.

1889. To enable the Secretary of the Interior to repair and protect the Ruin of Casa Grande, situate in Pinal County, near Florence, Ariz., $2,000; and the President is authorized to reserve from settlement and sale the land on which said ruin is situated and so much of the public land adjacent thereto as in his judgment may be necessary for the protection of said ruin and of the ancient city of which it is a part. Sundry civil act approved Mar. 2, 1889 (25 Stats., 939, 961) $2,000

For the pay of a custodian of Casa Grande Ruin, funds have been allotted from the appropriation "For necessary expenses of survey, appraisal and sale, and pay of custodians of abandoned military reservations, including a custodian of the Ruin of Casa Grande," contained in sundry civil acts, as follows:

1893.	Act approved Aug. 5, 1892 (27 Stats., 349, 370)	480
1894.	Act approved Mar. 3, 1893 (27 Stats., 572, 593)	480
1895.	Act approved Aug. 18, 1894 (28 Stats., 372, 396)	480
1896.	Act approved Mar. 2, 1895 (28 Stats., 910, 938)	480
1897.	Act approved June 11, 1896 (29 Stats., 413, 434)	480
1898.	Act approved June 4, 1897 (30 Stats., 11, 33)	480
1899.	Act approved July 1, 1898 (30 Stats., 597, 620)	480
1900.	Act approved Mar. 3, 1899 (30 Stats., 1074, 1098)	480
1901.	Act approved June 6, 1900 (31 Stats., 588, 616)	480
1902.	Act approved Mar. 3, 1901 (31 Stats., 1133, 1160)	662
1903.	Act approved June 28, 1902 (32 Stats., 419, 454)	900
	By this same act there was also appropriated for repair and protection of the Ruin of Casa Grande	2,000
1904.	Act approved Mar. 3, 1903 (32 Stats., 1083, 1117)	900
1905.	Act approved Apr. 28, 1904 (33 Stats., 452, 485)	900
1906.	Act approved Mar. 3, 1905 (33 Stats., 1156, 1186)	900
1907.	Act approved June 30, 1906 (34 Stats., 697, 726)	900
1908.	Act approved Mar. 4, 1907 (34 Stats., 1295, 1334)	900
1909.	Act approved May 27, 1908 (35 Stats., 317, 348)	900
1910.	Act approved Mar. 4, 1909 (35 Stats., 945, 987)	900
1911.	Act approved June 25, 1910 (36 Stats., 703, 741)	900
1912.	Act approved Mar. 4, 1911 (36 Stats., 1363, 1417)	900
1913.	Act approved Aug. 24, 1912 (37 Stats., 417, 457)	900
1914.	Act approved June 23, 1913 (38 Stats., 4, 47)	900
1915.	Act approved Aug. 1, 1914 (38 Stats., 609, 645)	900
1916.	Act approved Mar. 3, 1915 (38 Stats., 822, 856)	900
1917.	Act approved July 1, 1916 (39 Stats., 262, 301)	900
1918.	Act approved June 12, 1917 (40 Stats., 105, 144)	900
1919.	Act approved July 1, 1918 (40 Stats., 669)	900
	Total	24,282

UNDER THE SMITHSONIAN INSTITUTION.

Appropriations were made in sundry civil acts "For the protection of Casa Grande Ruin in Pinal County, near Florence, Ariz., and for excavation on the reservation, to be expended under the supervision of the secretary of the Smithsonian Institution," as follows:

1907.	Act approved June 30, 1906 (34 Stats., 697, 729)	$3,000
1908.	Act approved Mar. 4. 1907 (34 Stats., 1295, 1310)	3,000
	Total	6,000

[1] Set aside as a reservation by Executive order dated June 22, 1892, under the act approved March 2, 1889 (25 Stats., 961), and placed under the jurisdiction of the General Land Office. Boundaries changed by presidential proclamation of December 10, 1909 (35 Stats., 2504). Administered as a national park from 1915 to August 3, 1918, when it was made a national monument (40 Stats., Proc. 1470).

RECAPITULATION.

Appropriations under the Interior Department, 1889 to 1919, inclusive	$24,282
Appropriations under the Smithsonian Institution, 1907 and 1908	6,000
Total	30,282

NAVAJO NATIONAL MONUMENT, ARIZ.

1917. For preservation and repair of prehistoric Pueblo ruins and cliff dwellings, under supervision of the Smithsonian Institution, Indian appropriation act approved May 18, 1916 (39 Stats., 132) $3,000

ZION (FORMERLY MUKUNTUUWEAP) NATIONAL MONUMENT, UTAH

1917. For a proportionate share of the amount required to construct an interstate wagon road or highway through the monument, approximately 15 miles. Deficiency appropriation act approved Sept. 8, 1916 (39 Stats., 818) $15,000

APPENDIX D.

LEGISLATION.

Legislation affecting the national parks, enacted by Congress since date of the second annual report.

Legislation affecting the national parks, enacted by the States.

Executive orders relating to national parks, issued since date of the second annual report.

Senate and House of Representatives reports on pending legislation affecting the national parks made since date of the second annual report.

LEGISLATION.

An act to authorize the sale of certain lands at or near Yellowstone, Mont., for hotel and other purposes (40 Stats., 1152).

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be, and hereby is, authorized to sell and convey to Oregon Short Line Railroad Company, a corporation organized under the laws of the State of Utah and authorized to do business in the State of Montana, its successors and assigns, for hotel and other purposes, and at a price to be fixed by appraisement at not less than $25 per acre, and under such terms, conditions, and regulations as the Secretary of the Interior may prescribe, the following described lands, situated in Gallatin County, Montana: Lot three and the northeast quarter of the southwest quarter of section thirty-four, in township thirteen south, of range five east, Montana principal meridian, including the area at present covered by the right of way for the wye tracks of said Oregon Short Line Railroad Company; also all that portion of the southeast quarter of the northwest quarter of said section thirty-four lying south of the right of way and station grounds of said company, the entire tract above described consisting of eighty-eight and two one-hundredths acres; the right of way and station grounds of said Oregon Short Line Railroad Company and the right of way for the wye tracks of said company being designated in the filing map of the Yellowstone Park Railroad Company filed with the Secretary of the Interior, the land described being within the boundaries of the Madison National Forest: *Provided, however,* That any hotel erected on said lands shall be operated by the said Oregon Short Line Railroad Company, or its successors in interest, under such rules and regulations as the Secretary of the Interior may prescribe for the conduct and operation of hotels within the Yellowstone National Park.

Approved, January 25, 1919.

An act to establish the Grand Canyon National Park in the State of Arizona (40 Stat., 1175.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States and dedicated and set apart as a public park for the benefit and enjoyment of the people, under the name of the "Grand Canyon National Park," the tract of land in the State of Arizona particularly described by and included within metes and bounds as follows, to wit:

Beginning at a point which is the northeast corner of township thirty north, range one east, of the Gila and Salt River meridian, Arizona; thence west on township line between townships thirty and thirty-one north, range one east, to section corner common to sections one and two, township thirty north, range one east, and thirty-five and thirty-six, township thirty-one north, range one east; thence north on section lines to the intersection with Tobocobya Spring-Rowe Well Road; thence northwesterly along the southwesterly side of said Tobocobya Spring-Rowe Well Road, passing and in relation to United States Geological Survey bench marks stamped "Canyon" and numbered 6340, 6235, 6372, 6412, 6302, 6144, and 6129, through townships thirty-one and thirty-two north, ranges one east and one and two west, to its intersection with the section line between sections nine and sixteen in township thirty-two north, range two west; thence west along the section lines through townships thirty-two north, ranges two and three west, to its intersection with upper westerly rim of Cataract Canyon; thence northwesterly along upper rim of Cataract Canyon, crossing Hualapai Canyon and continuing northwesterly along said upper rim to its intersection with range line, township thirty-three north, between ranges four and five west; thence north on said range line, townships thirty-three and thirty-four north, ranges four and five west, to north bank of the Colorado River; thence northeasterly along the north bank of the Colorado River to

junction with Tapeats Creek; thence easterly along north bank of Tapeats Creek to junction with Spring Creek; thence easterly along the north bank of Spring Creek to its intersection with Gila and Salt River meridian, township thirty-four north, between ranges one east and one west and between section six, township thirty-four north, range one east, and section one, township thirty-four north, range one west; thence south on range line between ranges one east and one west to section corner common to sections seven and eighteen, township thirty-four north, range one east, and sections twelve and thirteen, township thirty-four north, range one west; thence east on section lines to section corner common to sections seven, eight, seventeen, and eighteen, township thirty-four north, range two east; thence south on section lines to township line between townships thirty-three and thirty-four north, range two east, at section corner common to sections thirty-one and thirty-two, township thirty-four north, range two east, and sections five and six, township thirty-three north, range two east; thence east on township line to section corner common to sections thirty-one and thirty-two, township thirty-four north, range three east, and sections five and six, township thirty-three north, range three east; thence south on section lines to section corner common to sections seventeen, eighteen, nineteen, and twenty, township thirty-three north, range three east; thence east on section lines to section corner common to sections thirteen, fourteen, twenty-three, and twenty-four, township thirty-three north, range three east; thence north on section lines to section corner common to sections one, two, eleven, and twelve, township thirty-three north, range three east; thence east on section lines to the intersection with upper rim of Grand Canyon; thence northerly along said upper rim of Grand Canyon to main hydrographic divide north of Nankoweap Creek; thence easterly along the said hydrographic divide to its intersection with the Colorado River, approximately at the mouth of Nankoweap Creek; thence easterly across the Colorado River and up the hydrographic divide nearest the junction of Nankoweap Creek and Colorado River to a point on the upper east rim of the Grand Canyon; thence by shortest route to an intersection with range line, townships thirty-three and thirty-four north, between ranges five and six east; thence south on said range line, between ranges five and six east, to section corner common to sections eighteen and nineteen, township thirty-three north, range six east, and sections thirteen and twenty-four, township thirty-three north, range five east; thence east on section lines to section corner common to sections sixteen, seventeen, twenty, and twenty-one, township thirty-three north, range six east; thence south on section lines to section corner common to sections eight, nine, sixteen, and seventeen, township thirty-one north, range six east; thence west on section line to section corner common to sections seven, eight, seventeen, and eighteen, township thirty-one north, range six east; thence south on section lines to township line between townships thirty and thirty-one north at section corner common to sections thirty-one and thirty-two, township thirty-one north, range six east, and sections five and six, township thirty north, range six east; thence west on township line to section corner common to sections thirty-four and thirty-five, township thirty-one north, range five east, and sections two and three, township thirty north, range five east; thence south on section line to section corner common to sections two, three, ten, and eleven, township thirty north, range five east; thence west on section lines to range line, township thirty north, between ranges four and five east, at section corner common to sections six and seven, township thirty north, range five east, and one and twelve, township thirty north, range four east; thence south on range line, township thirty north, between ranges four and five east, to section corner common to sections seven and eighteen, township thirty north, range five east, and sections twelve and thirteen, township thirty north, range four east; thence west on section line to section corner common to sections eleven, twelve, thirteen, and fourteen, township thirty north, range four east; thence south on section line to section corner common to sections thirteen, fourteen, twenty-three, and twenty-four, township thirty north, range four east; thence west on section lines to section corner common to sections fifteen, sixteen, twenty-one, and twenty-two, township thirty north, range four east; thence south on section line to section corner common to sections twenty-one, twenty-two, twenty-seven, and twenty-eight, township thirty north, range four east; thence west on section lines to range line, township thirty north, between ranges three and four east, at section corner common to sections nineteen and thirty, township thirty north, range four east, and sections twenty-four and twenty-five, township thirty north, range three east; thence north on range line to

section corner common to sections eighteen and nineteen, township thirty north, range four east, and sections thirteen and twenty-four, township thirty north, range three east; thence west on section lines to section corner common to sections fourteen, fifteen, twenty-two, and twenty-three, township thirty north, range three east; thence north on section line to section corner common to sections ten, eleven, fourteen, and fifteen, township thirty north, range three east; thence west on section lines to range line at section corner common to sections seven and eighteen, township thirty north, range three east, and sections twelve and thirteen, township thirty north, range two east; thence north on range line to section corner common to sections six and seven, township thirty north, range three east, and sections one and twelve, township thirty north, range two east; thence west on section line to section corner common to sections one, two, eleven, and twelve, township thirty north, range two east; thence north on section line to township line at section corner common to sections thirty-five and thirty-six, township thirty-one north, range two east, and sections one and two, township thirty north, range two east; thence west on township line to the northeast corner of township thirty north, range one east, the place of beginning.

SEC. 2. That the administration, protection, and promotion of said Grand Canyon National Park shall be exercised, under the direction of the Secretary of the Interior, by the National Park Service, subject to the provisions of the Act of August twenty-fifth, nineteen hundred and sixteen, entitled "An Act to establish a National Park Service, and for other purposes": *Provided*, That all concessions for hotels, camps, transportation, and other privileges of every kind and nature for the accommodation or entertainment of visitors shall be let at public bidding to the best and most responsible bidder.

SEC. 3. That nothing herein contained shall affect the rights of the Havasupai Tribe of Indians to the use and occupancy of the bottom lands of the Canyon of Cataract Creek as described in the Executive order of March thirty-first, eighteen hundred and eighty-two, and the Secretary of the Interior is hereby authorized, in his discretion, to permit individual members of said tribe to use and occupy other tracts of land within said park for agricultural purposes.

SEC. 4. That nothing herein contained shall affect any valid existing claim, location, or entry under the land laws of the United States, whether for homestead, mineral, right of way, or any other purpose whatsoever, or shall affect the rights of any such claimant, locator, or entryman to the full use and enjoyment of his land and nothing herein contained shall affect, diminish, or impair the right and authority of the county of Coconino, in the State of Arizona, to levy and collect tolls for the passage of live stock over and upon the Bright Angel Toll Road and Trail, and the Secretary of the Interior is hereby authorized to negotiate with the said county of Coconino for the purchase of said Bright Angel Toll Road and Trail and all rights therein, and report to Congress at as early a date as possible the terms upon which the property can be procured.

SEC. 5. That whenever consistent with the primary purposes of said park the Act of February fifteenth, nineteen hundred and one, applicable to the locations of rights of way in certain national parks and the national forests for irrigation and other purposes, and subsequent Acts shall be and remain applicable to the lands included within the park. The Secretary of the Interior may, in his discretion and upon such conditions as he may deem proper, grant easements or rights of way for railroads upon or across the park.

SEC. 6. That whenever consistent with the primary purposes of said park, the Secretary of the Interior is authorized, under general regulations to be prescribed by him, to permit the prospecting, development, and utilization of the mineral resources of said park upon such terms and for specified periods, or otherwise, as he may deem to be for the best interests of the United States.

SEC. 7. That, whenever consistent with the primary purposes of said park, the Secretary of the Interior is authorized to permit the utilization of areas therein which may be necessary for the development and maintenance of a Government reclamation project.

SEC. 8. That where privately owned lands within the said park lie within three hundred feet of the rim of the Grand Canyon no building, tent, fence, or other structure shall be erected on the park lands lying between said privately owned lands and the rim.

SEC. 9. The Executive order of January eleventh, nineteen hundred and eight, creating the Grand Canyon National Monument, is hereby revoked and repealed, and such parts of the Grand Canyon National Game Preserve, designated under

authority of the Act of Congress, approved June twenty-ninth, nineteen hundred and six, entitled "An Act for the protection of wild animals in the Grand Canyon Forest Reserve," as are by this Act included with the Grand Canyon National Park are hereby excluded and eliminated from said game preserve.

Approved, February 26, 1919.

An Act To establish the Lafayette National Park in the State of Maine (40 Stats., 1178).

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tracts of land, easements, and other real estate heretofore known as the Sieur de Monts National Monument, situated on Mount Desert Island, in the county of Hancock and State of Maine, established and designated as a national monument under the Act of June eighth, nineteen hundred and six, entitled "An Act for the preservation of American antiquities," by presidential proclamation of July eighth, nineteen hundred and sixteen, is hereby declared to be a national park and dedicated as a public park for the benefit and enjoyment of the people under the name of the Lafayette National Park, under which name the aforesaid national park shall be entitled to receive and to use all moneys heretofore or hereafter appropriated for Sieur de Monts National Monument.

SEC. 2. That the administration, protection, and promotion of said Lafayette National Park shall be exercised under the direction of the Secretary of the Interior by the National Park Service, subject to the provision of the Act of August twenty-fifth, nineteen hundred and sixteen, entitled "An Act to establish a National Park Service, and for other purposes," and Acts additional thereto or amendatory thereof.

SEC. 3. That the Secretary of the Interior is hereby authorized, in his discretion, to accept in behalf of the United States such other property on said Mount Desert Island, including lands, easements, buildings, and moneys, as may be donated for the extension or improvement of said park.

Approved, February 26, 1919.

An act to repeal the last proviso of section four of an act to establish the Rocky Mountain National Park, in the State of Colorado, and for other purposes, approved January twenty-sixth, nineteen hundred and fifteen (40 Stat., 1271).

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the last proviso of section four of an act entitled "An act to establish the Rocky Mountain National Park, in the State of Colorado, and for other purposes," approved January twenty-sixth, nineteen hundred and fifteen, which is in the words and figures following: "*Provided,* That no appropriation for the maintenance, supervision, or improvement of said park in excess of $10,000 annually shall be made unless the same shall have first been expressly authorized by law," be, and the same is hereby, repealed.

Approved, March 1, 1919.

Excerpts from "An act making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and twenty, and for other purposes."

DEPARTMENT OF THE INTERIOR.

NATIONAL PARKS.

National Park Service: Director, $4,500; assistant director, $2,500; chief clerk, $2,000; editor, $2,000; draftsman, $1,800; clerks—two of class three, two of class two, one $1,020, two at $900 each; messenger, $600; in all, for park service in the District of Columbia, $22,220.

Crater Lake National Park, Oregon: For protection and improvement, and repairing and extension of roads, including not exceeding $300 for the maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for the use of the superintendent and employees in connection with general park work, $28,225.

General Grant National Park, California: For protection and improvement, construction of fences and trails, and repairing and extension of roads, $6,000.

Glacier National Park, Montana: For administration and improvement, construction of roads, trails, bridges, and telephone lines and the repair thereof, including necessary repairs to the roads from Glacier Park Station through the Blackfeet Indian Reservation to various points in the boundary line of the

Glacier National Park, including not exceeding $1,000 for the maintenance, repair, and operation of one motor-driven and one horse-drawn passenger-carrying vehicle for the use of the superintendent and employees in connection with general park work, $85,000.

Grand Canyon National Park, Arizona: For administration, protection, maintenance, improvement, and development, including not exceeding $2,500 for the purchase, maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for the use of the superintendent and employees in connection with general park work, $40,000.

Hawaii National Park: For expenses incident to securing donations of patented lands and rights of way over patented lands in Hawaii National Park, $750.

Hot Springs Reservation, Arkansas: The unexpended balance of the appropriation and authorization contained in the Sundry Civil Appropriation Act for the fiscal year 1919 for the construction of a new administration and Government free bathhouse building is reappropriated and made available for the fiscal year 1920. The Secretary of the Interior is authorized, in his discretion, to use such appropriation and authorization in the construction of separate buildings for administration and free bathhouse purposes and to accept sites in the city of Hot Springs which may be donated for said buildings.

Lafayette National Park, Maine: For administration, maintenance, protection, and improvement, including not exceeding $600 for maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for use in administration of the park, $10,000.

Mesa Verde National Park, Colorado: For protection and improvement, including not exceeding $1,500 for purchase, maintenance, operation, and repair of horse-drawn and motor-driven passenger-carrying vehicles for use of the superintendent and employees, $11,000.

Mount Rainier National Park, Washington: For protection and improvement, construction of roads, bridges, fences, and trails, and improvement of roads, including not exceeding $500 for the maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for use of the superintendent and park employees in connection with general park work, $32,500.

National Monuments: For the preservation, development, administration, and protection of the national monuments, to be expended under the direction of the Secretary of the Interior, $8,000.

Platt National Park, Oklahoma: For improvement and protection, $6,000.

Rocky Mountain National Park, Colorado: For protection and improvement, $10,000.

Sequoia National Park, California: For protection and improvement, construction and repair of bridges, fences, and trails, improvement of roads other than toll roads, including not exceeding $500 for the maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for the use of the superintendent and employees in connection with the general park work, $35,000.

Wind Cave National Park, South Dakota: For improvement and protection, $4,000.

Yellowstone National Park, Wyoming: For administration, protection, maintenance, and improvement, including not to exceed $7,500 for maintenance of the road in the forest reserve leading out of the park from the east boundary, not to exceed $7,500 for maintenance of the road in the forest reserve leading out of the park from the south boundary, not to exceed $15,000 for a bridge over the Buffalo Fork of the Snake River on the Lander approach, not to exceed $7,600 for the purchase, operation, maintenance, and repair of motor-propelled passenger-carrying vehicles, and including feed for buffalo and other animals and salaries of buffalo keepers, $255,500, to be expended by and under the direction of the Secretary of the Interior: *Provided*, That not exceeding $2,000 may be expended for the removal of snow from any of the roads for the purpose of opening them in advance of the tourist season.

Yosemite National Park, California: For protection and improvement, construction and repair of bridges, fences, and trails, and improvement of roads other than toll roads; including not exceeding $2,300 for purchase, maintenance, operation, and repair of horse-drawn and motor-driven passenger-carrying vehicles for use of the superintendent and employees in connection with general park work, not exceeding $55,000 for grading in width not exceeding twenty feet El Portal-Yosemite Road, $200,000.

Approved, July 19, 1919 (41 Stat., 204).

STATE LEGISLATION.

CALIFORNIA.

An act to cede to the United States exclusive jurisdiction over Yosemite National Park, Sequoia National Park, and General Grant National Park, in the State of California.

The people of the State of California do enact as follows:

SECTION 1. Exclusive jurisdiction shall be and the same is hereby ceded to the United States over and within all of the territory which is now or may hereafter be included in those several tracts of land in the State of California set aside and dedicated for park purposes by the United States as "Yosemite National Park," "Sequoia National Park," and "General Grant National Park," respectively; saving, however, to the State of California the right to serve civil or criminal process within the limits of the aforesaid parks in suits or prosecutions for or on account of rights acquired, obligations incurred, or crimes committed in said State outside of said parks; and saving further to the said State the right to tax persons and corporations, their franchises and property on the lands included in said parks, and the right to fix and collect license fees for fishing in said parks; and saving also to the persons residing in any of said parks now or hereafter the right to vote at all elections held within the county or counties in which said parks are situate: *Provided, however*, That jurisdiction shall not vest until the United States through the proper officer notifies the State of California that they assume police jurisdiction over said parks.

Approved, April 15, 1919.

MONTANA.

An act to amend chapter 173, laws of the Fifteenth Legislative Assembly of the State of Montana, relating to the general fish and game laws, by adding thereto section 5A.

Be it enacted by the Legislative Assembly of the State of Montana:

SEC. 1. That chapter 173 of the laws of the Fifteenth Legislative Assembly of the State of Montana, be and the same is hereby amended by adding thereto a section numbered 5A, as follows:

SEC. 5A. All licenses issued under the provisions of the act shall have printed upon the face thereof in large black-faced type the following words:

"This license does not authorize the holder to hunt within the boundaries of any National Park within the State of Montana."

SEC. 2. All acts and parts of acts in conflict herewith are hereby repealed.

SEC. 3. This act shall be in full force and effect from and after its passage and approval.

Approved March 6, 1919.

EXECUTIVE ORDER.

MONTANA.

Under authority of the act of Congress approved June 25, 1910 (36 Stat., 847), as amended by the act of August 24, 1912 (37 Stat., 497), and subject to the conditions therein expressed, and the provisions of existing power site withdrawals, it is hereby ordered that the public lands in the following described areas in the State of Montana be, and the same are hereby, temporarily withdrawn in aid of legislation to secure the use of the lands as a game preserve: In T. 7 S., R. 7 E., secs. 29, 30, and that part of sec. 32 north and east of the Yellowstone River; in T. 8 S., R. 7 E., secs. 1, 2, lots 8, 9, 10, 11, and E ½ of sec. 3, lots 1, 2, 3, 7 and 8 of sec. 4, E ½ of sec. 10, secs. 11 to 16, inclusive, 21 to 28, inclusive, secs. 35 and 36; in T. 9 S., R. 7 E., secs. 1, 2, 11 and 12; in T. 8 S., R. 8 E., secs. 7, 8, 17, 18, 19, 20, 29, 30, 31 and 32; in T. 9 S., R. 8 E., secs. 5 to 18, inclusive, and 20 to 24, inclusive; in T. 9 S., R. 9 E., secs. 7, 8, 9, and 16 to 21, inclusive; Montana principal meridian.

WOODROW WILSON.

THE WHITE HOUSE,
28 Feb'y, 1919.

[No. 3053.]

REPORTS ON LEGISLATION.

[Senate Report No. 647, Sixty-fifth Congress, Third Session.]

SEQUOIA NATIONAL PARK.

January 14 (calendar day, January 16), 1919.—Ordered to be printed.

Mr. PHELAN, from the Committee on Public Lands, submitted the following report (to accompany S. 2021).

The Committee on Public Lands, to which was referred the bill (S. 2021) to add certain lands to the Sequoia National Park, Cal., having had the same under consideration, begs leave to report it back to the Senate with the following amendments and as amended recommend that the bill do pass.

Page 1, line 3, strike out "Sequoi" and insert "Sequoia."

Page 1, line 4, after "follows" insert a comma and the words "and that the park be hereafter designated the Roosevelt National Park, in honor of Theodore Roosevelt, late President of the United States."

Page 9, line 12, strike out all of section 3, and insert in lieu thereof the following:

That nothing in this act shall in any way modify or affect the mineral land or coal land laws now applicable to the lands hereby added to said park.

Amend the title so as to read:

A bill to add certain lands to the Sequoia National Park, California, and to change the name of said park to Roosevelt National Park.

THE AREA INCLUDED IN THE PARK.

The land which this bill proposes to add to the Sequoia National Park (265 square miles at present) lies north and east of the park and is easily accessible by trail from the Giant Forest. It comprises a large area of mountain-top country approximating 1,335 square miles, making a total area of 1,600 square miles. Its eastern boundary of about 70 miles is the very crest of the Sierra Nevada Mountains, including Mount Whitney, whose elevation of 14,501 feet is the loftiest in the United States. Along this magnificent crest lies a massing of mountain peaks of indescribable grandeur, for Mount Whitney is no towering elevation, but merely a granite climax; its peak is a little higher than its neighbors, that is all.

Eastward from this crest descend superbly tumbled slopes rich in the grandest scenery of America and the world, merging, below the timber line, into innumerable lake-studded valleys which converge into the extraordinary valleys of the Kings and the Kern Rivers. Two branches of the Kings River flow through valleys destined, when known, to a celebrity second only to Yosemite Valley; one of these is the Tehipite Valley, the other the Kings River Canyon. These lie north of the Sequoia National Park, while on its east lies still another valley of future world celebrity, the Kern Canyon.

This area which, united with the present Sequoia National Park, would make a "Greater Sequoia" of 1,600 square miles, constitutes a total of supreme scenic magnificence. It would make a national park unexcelled even in America for sublimity and unequaled anywhere for rich variety. It is penetrated by trails and affords, with its three foaming rivers, its thousands of streams, its hundreds of lakes, its splendid forests, occasional meadows, castellated valleys, inspiring passes, and lofty glacier-shouldered summits, the future camping-out resort of many thousands yearly.

The Tehipite Valley and the Kings River Canyon, which are more accessible now than the Kern Canyon, have striking nobility of scenery. The walls of both are as sheer as and are often loftier than Yosemite's. The rivers which flow through them are glacier-run torrents of innumerable cascades and waterfalls, lined to the edge with forests and full of fighting trout.

Both valleys are guarded, like Yosemite, with gigantic rocks. The Tehipite Dome in the Tehipite Valley and the Grand Sentinel in the Kings River Canyon must be classed with Yosemite's greatest. The Tehipite Valley has grandeur for its keynote, as the Yosemite Valley has supreme beauty. The Kings River Canyon, with Paradise Valley a few miles upstream, is destined, at no great lapse of time, to become the summer resort of innumerable campers.

The public land proposed to be added to Sequoia National Park by these measures will never be valuable for any other than park purposes. Cattle are grazed on the mountain meadows during part of the year, but the administration of these meadows as part of the park will not interfere with the exercise of grazing privileges for many years to come. Small tracts of land here and there will be fenced for pasturage of live stock used by tourists.

In this connection some remarks submitted in the House by Hon. Frederick H. Gillett on January 14, 1919, have the value of personal testimony:

Mr. Chairman, I simply wish to indorse the statement which the gentleman from California has made. Three years ago I went through this Sequoia National Park and the King and Kern Valleys that he speaks of. We went in, out of the reach of the telegraph or the mail, with a pack train and I spent there two of the most interesting and healthful weeks of my life. I do not suppose it is possible to compare different beauties of nature according to their relative excellence, but if there is any finer scenery in the world than this I should like to see it. But until I have seen it I shall be skeptical about it and be satisfised with the wonderful picturesqueness and variety of the valleys and gorges and mountains and chasms and streams of this extraordinary region. It did not seem to me it was useful for anything except a great camping-out place for the American people. Possibly a few sure-footed animals might get grazing there, but it was apparently created as a grand aggregation of scenic beauty, where tired man could refresh and enjoy himself. As the gentleman from California [Mr. Elston] has said, it is very desirable that the present Sequoia Park should be enlarged so as to include this neighboring tract of wonderful scenery, and then nothing could be more appropriate than to name the whole after such a lover of nature as Theodore Roosevelt.

THE PROPOSED DESIGNATION—ROOSEVELT NATIONAL PARK.

The Secretary of the Interior, Hon. Franklin K. Lane, and the director of the National Park Service, Stephen T. Mather, urge not only the enlargement of the Sequoia National Park but that it be named in honor of the late and well-beloved President and man, Theodore Roosevelt.

With respect to the proposed change in the name of the park the committee is unanimously in its favor. They believe it to be extremely fitting that this great park, which includes some of the most magnificent scenery in this country, should serve as a national monument to a great American.

In proposing the amendment on January 13, 1919, Senator Phelan spoke as follows:

Theodore Roosevelt was early identified with the West, and the west of the West. He sought among the great mountain ranges and the vast expanse of prairie a field for his abounding energy. From his narrow environment of city streets and congested population he naturally sought expansion. The liberalizing influences of the western life nationalized him and prepared him doubtless for the larger tasks which he was destined to assume. I can not imagine a more fitting memorial for a man of his character, courage, culture, generous nature, and love of the beautiful than the rugged, wild, and sublime scenery embraced in the region of central California. The story of William Tell might apply with equal pertinency to Theodore Roosevelt, who learned his love of liberty from his love of nature. He, too, was influenced by the mountain streams, which "plough the valleys without asking leave" and the mountain peaks, which "wear their caps of snow in the very presence of the regal sun." Here are the King and Kern River canyons, Mount Whitney, the highest in the continental United States proper, and here in the crystal pure waters, "never too grave to smile, too tired to run," disport the golden trout, peculiar to this place alone, and already bearing the scientific description of Salmo Rooseveltii. There is no equal area on earth superior in natural wonders. It is bounded by the crests of the high Sierra; cataracts leap in glory from altitudinal clefts; giant trees lift their heads far above the besetting fog, erect amidst tempests, resplendent in the light of day, wreathed in immortels, and serenely at home in the free air of Heaven. California—a State richly endowed by nature—can dedicate no finer monument to Roosevelt than this, the choicest of her natural gifts, nor the Nation a more appropriate memorial.

The legislation embodied in this bill has the approval of the Interior Department as set forth in the following letter, addressed to the chairman of the Committee on Public Lands of the Senate:

THE SECRETARY OF THE INTERIOR,
Washington, May 15, 1918.

MY DEAR SENATOR: I have your request for a report on S. 2021, "A bill to add certain lands to Sequoia National Park."

Sequoia National Park as now constituted was set apart in 1890 to preserve several magnificent groves of giant Sequoia trees (sequoia washingtoniana), the finest of which, the Giant Forest, is to-day the chief feature of interest to the visitor. The territory that would be added to this park by the enactment of the bill under consideration is approximately 1,300 square miles in extent and lies mostly east and north of the boundaries as now established.

Scenically this country is unexcelled, of its kind, in the United States. Its eastern boundary follows the crest of the Sierra Nevada Mountains, from a point 55 miles below the Yosemite National Park's southern boundary southward to and including the climax of the Sierra, which is the mountain grouping in the neighborhood of our

loftiest summit, Mount Whitney. In kind it is similar to Yosemite, but differs materially in variety, in climax, and particularly in the extraordinary massing of the peaks. Its small glaciers are many. Its granite cirques have unusual size and majesty. Lofty precipices abound. Interesting volcanic phenomena add to its picturesqueness and scientific significance. I know of no country of similar magnificence whose fastnesses can be penetrated and enjoyed with similar comfort because of the practical absence of rain during the summer months. Few trail travelers carry tents.

The slopes falling from this crest to the western boundaries of the proposed addition have equal distinction. This is an area of tumbled cross ranges holding between them canyons of exceptional wildness and charm. The number and variety of lakes is the traveler's constant surprise. The rivers formed by the confluence of innumerable cascading streams pass through gorges, several of which are comparable in magnificence only to the Yosemite Valley. "There are many Yosemites," writes Muir, and the several next in order of beauty are surely here. For sheer grandeur, Tehipite may even excel Yosemite. The rock walls of the Tehipite Valley and the Kings River Canyon frequently exceed Yosemite's in height. Those of Kern Canyon, Paradise Valley, and Fish Valley are only a little less. Tehipite Dome, the Grand Sentinel, and other outstanding rocks bear scenic comparison with Yosemite's greatest rock features and are likely to become as celebrated.

I use the comparison only because of public familiarity with Yosemite. This country is no repetition. It is highly individual and different. But even if it were repetition, a sound reason for this additional reservation would still exist. The generation is not far ahead which will need two Yosemites for its use and pleasure.

Finally, there is a reason founded upon proportion and relationship. It seems to me that there is a peculiar fitness in adding to the distinction of Sequoia's forests of giant trees the further distinction of this colossal massing of mountains and of these extraordinary canyons. The common note is apparent. To unite them is to complete a whole, to create a national park in the superlative degree.

All of this country is covered at the present time by forest reservations, a part of it being in the Sequoia National Forest and a part in the Sierra Forest. There is little opportunity for commercial development of this region. Much of it is far above timber line and practically no part of it lies below the 7,500-foot contour line. It is useless for farming purposes, although the mountain meadows are largely utilized for the pasturage of live stock during the summer months.

The region is not accessible longer than four months of the year. The snowfall is heavy in winter. It closes the passes early in autumn and opens them by its disappearance late in the spring. Magnificent as it is in the summer months, when this region can be visited and enjoyed by the lover of the mountains, it is a forbidding land at all other times.

There is some merchantable timber on the outskirts of the territory covered by this bill, but it should be preserved to protect the watersheds of the rivers and creeks and to complete the scenic features of the park. Part of this timber is of the giant Sequoia species, two fine groves of these great trees standing only a short distance from areas now being cut over. It is unnecessary to remark that this timber should be safeguarded forever.

Section 3 of the pending bill would permit the location of mining claims in the enlarged park. I would suggest, however, that this section be amended to read as follows:

"That nothing in this act shall in any way modify or affect the mineral-land laws now applicable to the lands hereby added to said park."

It does not appear advisable to open the present park to prospecting for minerals.

Under section 2 of the bill, water power and grazing permits may be granted where the development of power and the use of park lands for the pasturage of cattle "is not detrimental to the primary purpose for which the park was created." This section refers to the National Park Service act of August 25, 1916 (39 Stat., 535), which in section 4 specifically provides that nothing therein shall affect the act of February 15, 1901 (31 Stat., 790).

There is danger that private rights may be acquired in strategic portions of this territory, owing to the fact that such rights are now obtainable within national forests. For any portion of the floor of the main Kings River Canyon, Tehipite, and Paradise Valleys, and other Yosemite-like valleys, to be acquired by private interests to the exclusion of the public would be a serious national loss. At the present time, fortunately, there are comparatively few private holdings in the region.

I am forwarding herewith a list of patented and unperfected entries, State lands, pending selections, and reconveyances, and rights of way, with names of entrymen as shown by the records of the General Land Office. It will be noted that the total area of the alienated lands in the park as it will be constituted if enlarged as proposed is 30,295.97 acres, of which 26,593.30 acres are in the territory to be added. Eleven thousand two hundred and forty acres are bases of pending lieu selections under the act of June 4, 1897 (30 Stat., 36), and 2,010 acres are bases of pending State school indemnity selections.

The inclosed map indicates the boundaries of the present Sequoia Park and the boundaries it will have if enlarged as proposed by the pending measure.

So far as the administration of the region is concerned, I would observe that the enlargement of the park would involve only a slight increase of appropriation during the war period.

I regard this park project as most meritorious and I unhesitatingly urge that it be favorably considered by your committee.

Cordially, yours,

FRANKLIN K. LANE,
Secretary.

Hon. H. L. MYERS,
Chairman Committee on Public Lands, United States Senate.

[House Report No. 1063, Sixty-fifth Congress, Third Session.]

CHANGE NAME OF SEQUOIA NATIONAL PARK TO ROOSEVELT NATIONAL PARK.

February 12, 1919.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. Ferris, from the Committee on the Public Lands, submitted the following report (to accompany S. 2021).

The Committee on the Public Lands, to whom was referred Senate bill 2021, having had the same under consideration, respectfully submit the following report:

Amend the bill by striking out all after the enacting clause and inserting in lieu thereof the following:

That the name of the Sequoia National Park, Cal., is hereby changed to the Roosevelt National Park, in honor of Theodore Roosevelt, late President of the United States.

SEC. 2. That the regulations governing the park shall include provisions for the use of automobiles therein and the reasonable grazing of stock.

SEC. 3. That the Secretary of the Interior may sell and permit the removal of such matured or dead or down timber as he may deem necessary or advisable for the protection or improvement of the park.

Amend the title so as to read: "To change the name of Sequoia National Park to Roosevelt National Park."

There are within the present boundaries of the Sequoia National Park 235 square miles or about 250,000 acres.

The bill as it passed the Senate proposes to add thereto 1,335 square miles or about 1,200,000 acres.

There is some controversy between the Department of the Interior and the Department of Agriculture as to the proper boundaries for the proposed addition to the Sequoia National Park.

Therefore your committee struck out all of the proposed addition and limited the scope of the bill simply to changing the name of the Sequoia National Park to Roosevelt National Park in honor of the late Theodore Roosevelt.

It was the thought of your committee that this would popularize the park and increase its attractiveness, and would be a source of great gratification to the millions of admirers of the late President, and would be a proper recognition and tribute to his life and memory.

Your committee have been petitioned and solicited from every corner of the country to report this bill. No one bill that has been before the Committee on the Public Lands in recent years has received such uniform interest.

There will be those who will object to this proposed change and feel that it is a sentimental matter. There will be others who will object to it for reasons of their own.

To the majority of your Committee on the Public Lands it was thought to be a proper recognition.

The bill has passed the Senate. The present session will soon draw to a close. The passage of the bill was earnestly advocated by the Secretary of the Interior, the Director of the National Park Service, and numerous other enthusiasts who appeared in person and advocated and urged that the bill be passed. Copies of reports from the departments are attached herewith and made a part hereof, together with a statement of Secretary Lane made before your committee.

THE SECRETARY OF THE INTERIOR,
Washington, May 15, 1918.

MY DEAR MR. FERRIS: I have your request for a report on H. R. 10929, a bill to add certain lands to Sequoia National Park.

Sequoia National Park as now constituted was set apart in 1890 to preserve several magnificient groves of giant Sequoia trees (*Sequoia washingtoniana*), the finest of which, the Giant Forest, is to-day the chief feature of interest to the visitor. The territory that would be added to this park by the enactment of the bill under consideration is approximately 1,300 square miles in extent and lies mostly east and north of the boundaries as now established.

Scenically this country is unexcelled, of its kind, in the United States. Its eastern boundary follows the crest of the Sierra Nevada Mountains, from a point 55 miles below the Yosemite National Park's southern boundary, southward to and including the climax of the Sierra, which is the mountain grouping in the neighborhood of our loftiest summit, Mount Whitney. In kind it is similar to Yosemite, but differs materially in variety, in climax, and particularly in the extraordinary massing of the peaks. Its small glaciers are many. Its granite cirques have unusual size and majesty. Lofty precipices abound. Interesting volcanic phenomena add to its picturesqueness and scientific significance. I know of no country of similar magnificence whose fastnesses can be penetrated and en-

joyed with similar comfort, because of the practical absence of rain during the summer months. Few trail travelers carry tents.

The slopes falling from this crest to the western boundaries of the proposed addition have equal distinction. This is an area of tumbled cross ranges holding between them canyons of exceptional wildness and charm. The number and variety of lakes is the traveler's constant surprise. The rivers formed by the confluence of innumerable cascading streams pass through gorges several of which are comparable in magnificence only to the Yosemite Valley. "There are many Yosemites," writes Muir, and the several next in order of beauty are surely here. For sheer grandeur Tehipite may even exceed Yosemite. The rock walls of the Tehipite Valley and the Kings River Canyon frequently exceed Yosemite's in height. Those of Kern Canyon, Paradise Valley, and Fish Valley are only a little less. Tehipite Dome, the Grand Sentinel, and other outstanding rocks bear scenic comparison with Yosemite's greatest rock features and are likely to become as celebrated.

I use the comparison only because of public familiarity with Yosemite. This country is no repetition. It is highly individual and different. But even if it were repetition, a sound reason for this additional reservation would still exist. The generation is not far ahead which will need two Yosemites for its use and pleasure.

Finally, there is a reason founded upon proportion and relationship. It seems to me that there is a peculiar fitness in adding to the distinction of Sequoia's forests of giant trees the further distinction of this colossal massing of mountains and of these extraordinary canyons. The common note is apparent. To unite them is to complete a whole, to create a national park in the superlative degree.

All of this country is covered at the present time by forest reservations, a part of it being in the Sequoia National Forest and a part in the Sierra Forest. There is little opportunity for commercial development of this region. Much of it is far above timber line, and practically no part of it lies below the 7,500-foot contour line. It is useless for farming purposes, although the mountain meadows are largely utilized for the pasturage of live stock during the summer months.

The region is not accessible longer than four months of the year. The snowfall is heavy in winter. It closes the passes early in autumn and opens them by its disappearance late in the spring. Magnificent as it is in the summer months, when this region can be visited and enjoyed by the lover of the mountains, it is a forbidding land at all other times.

There is some merchantable timber on the outskirts of the territory covered by this bill, but it should be preserved to protect the watersheds of the rivers and creeks and to complete the scenic features of the park. Part of this timber is of the giant Sequoia species, two fine groves of these great trees standing only a short distance from areas now being cut over. It is unnecessary to remark that this timber should be safeguarded forever.

Under section 2 of the bill, water power and grazing permits may be granted where the development of power and the use of park lands for the pasturage of cattle "is not detrimental to the primary purpose for which the park was created." This section refers to the national park service act of August 25, 1916 (39 Stat., 535), which in section 4 specifically provides that nothing therein shall affect the act of February 15, 1901 (31 Stat., 790).

There is danger that private rights may be acquired in strategic portions of this territory, owing to the fact that such rights are now obtainable within national forests. For any portion of the floor of the main Kings River Canyon, Tehipite, and Paradise Valleys, and other Yosemitelike valleys, to be acquired by private interests to the exclusion of the public would be a serious national loss. At the present time, fortunately, there are comparatively few private holdings in the region.

I am forwarding a map herewith which shows the patented and unperfected entries, State lands, pending selections and reconveyances, rights of way, and administrative site withdrawals. A list of these entries, selections, etc., with names of entrymen, as shown by the records of the General Land Office, is also inclosed. It will be noted that the total alienated area is 30,295.97 acres, of which 11,240 acres are bases of pending lieu selections under the act of June 4, 1897 (30 Stat., 36), and 2,010 acres are bases of pending State school indemnity selections.

The inclosed map also indicates the boundaries of the present Sequoia Park and the boundaries it would have if enlarged as proposed by the pending measure.

So far as the administration of the region is concerned, I would observe that the enlargement of the park would involve only a slight increase of appropriation during the war period.

I regard this park project as most meritorious, and I unhesitatingly urge that it be favorably considered by your committee. I have no criticism to make of the provisions of the bill in its present form.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

Hon. SCOTT FERRIS,
Chairman Committee on the Public Lands,
House of Representatives.

DEPARTMENT OF AGRICULTURE.
Washington, December 30, 1918.

Hon. SCOTT FERRIS,
House of Representatives.

DEAR MR. FERRIS: Reference is made to H. R. 10229, a bill to add certain lands to the Sequoia National Park, Cal., a copy of which you have referred to this department, with the request that your committee be informed as to the law and facts relating thereto, and be given such suggestions as this department may see fit to offer.

By acts of Congress approved September 25, 1890 (26 Stat., 478), and October 1, 1890 (26 Stat., 650), certain public lands in the State of California were withdrawn from disposal under the public-land laws for the primary purpose of protecting from destruction the timber growing thereon. The latter act expressly stated that the lands would be set aside as a forest reservation. Some of the lands so reserved were subsequently incorporated in the Sequoia National Park, which now has an area of approximately

161,000 acres. It is proposed, under H. R. 10929, to extend the boundaries of this park so as to embrace an area of approximately 1,027,000 acres by adding thereto approximately 866,000 acres now in the Sequoia and Sierra National Forests.

In brief, the bill proposes to extend the national park eastward across the Kern River to Kern Peak, thence north along divides to the crest of the Sierra Nevada Mountains, and northward and westward along the crest of the Sierras, a distance of approximately 74 miles as the crow flies, from Kern Peak to a point designated on the map as Pine Creek Pass. The bill would also change the boundary by extending the west boundary of the present park northward across Kings River just below the junction of the South Fork and Middle Fork, thence following the divide between Middle Fork and the North Fork of Kings River to the head of the North Fork, and then by various meanders to Pine Creek Pass, the whole having the general form of a triangle, with the base resting along the present south boundary and the apex at Pine Creek Pass.

The immense area which it is proposed to transfer from the national forest to the national park is known to contain a number of scenic features of first-rate importance, the most notable being Mount Whitney and the canyon of the South Fork of Kings River. Unquestionably these two features are chiefly valuable for their scenic interest and should be retained and administered with a view to make them available for the instruction and entertainment of the public.

At the same time, this area marked is known to contain considerable bodies of timber, aggregating, it is estimated, some two billion feet, as well as a large area of grazing land, now in use under national forest regulations, which is important to the local communities. It is apparent that the future use of these economic resources must be given very careful consideration in planning for the administration of the area and in determining whether or not it should be transferred from the national forest.

The presence of these important natural resources now under use by the local communities, and the bearing which this transfer will have upon the future administration of the two national forests, makes it impossible for this department to approve the boundary as proposed in advance of a thorough field examination upon the ground. This boundary is substantially similar to that proposed to S. 5913, for which a field examination was planned by the Forest Service during the past season. Unfortunately, war emergencies, which drew from the Forest Service over 500 officers of its regular force and placed upon the remaining officers new and unexpected burdens, prevented the examination from being made. Pending the completion of the examination, which can not be made before August, 1919, this department must advise against favorable action of the measure.

Very truly, yours,

D. F. HOUSTON, *Secretary.*

STATEMENT OF HON. FRANKLIN K. LANE, SECRETARY OF THE INTERIOR, WASHINGTON, D. C.

Secretary LANE. I just want to say a word of indorsement, Mr. Chairman and gentlemen. I have a line from Senator Phelan this morning saying because he is laid up at his house he could not be here, and he asked me if I wouldn't say a word to you. I can add nothing to what Mr. Mather has said as to the topography of the country. I have never been there myself, but from my boyhood I have heard of it.

Mr. SMITH. You mean you have never seen the big trees of California?

Secretary LANE. Yes. But I have never been in the Kings River Canyon or the Kern River Canyon. I have talked with many who have been there, however. I think, perhaps, the lovers of high-mountain scenery regard this as the choicest place in the whole United States. I spoke a little while ago with a young man who has lived there, one of our naval men who had been all over the United States, and he told me that there was nothing that he regarded as equally fine with this particular district. The most of it is now inaccessible. Only the men who are intent and persistent and used to hardships ever get there. That country ought to be accessible to the people of the United States.

We are developing a system of parks for the people. They are growing every year. There are not a great many more to be taken in. There are not many more considerable sections of the country that can reasonably be constituted into parks; but we ought to get those sections that are concededly fitted for that purpose preeminently within the jurisdiction of the National Park Service before any questions arise as to private holdings, or any development takes place within areas.

It has been in mind a long while that this Sequoia Park should be extended. This is the natural extension of it. This development is going to take place some time. It might just as well take place now. The name that is suggested for the park, naming this the Roosevelt Park, particularly appeals to me, and particularly, I think, appeals to the West. It would be a graceful thing on the part of this Congress, especially as it is a Democratic Congress, to give this vast monument a name after a man who took so much interest in the West.

Without regard to partisanship, we regard Roosevelt as a western man. He lived part of the time in the West. He took a deep interest in it. He spoke its language. There was a sort of directness and a bluntness and forthrightness about the man's virility and strength that particularly appealed to our western people. There is nothing probably that we could do that would more properly fit in with the character of the man than to take these high, rugged mountains of the far West and name them after him. It would be an appropriate monument to the man who loved the open places in all parts of this country.

He is going to be known as a sort of boys' hero. He is going to be known preeminently for his manliness. There is going to be a Roosevelt legend. He is the kind of man that legends like to play with. He is the kind of man that the sagas and iliads and idylls have been written about, because they have not been written about men who have not got the directness and expressiveness of the primal man, the man who has this ruggedness and strength and personal prowess and endurance; and we will find that as time goes on that that quality in him will be emphasized, and that will make him in course of time the real boys' hero, and there is no truer fame than that.

Now I say that this is a good time to dedicate this area as a national park, and it is very appropriate that that area should be named after that man whose very spirit this section of the country represents.

Our general national-park policy is this: That those places which are not needed for the development of the resources of the country and which have a particular call upon

some of the æsthetics of the more exalted sentiments shall be set aside and preserved for the people. California is particularly blessed with having territory of that kind. But you can see from your general survey of the country, and what you have done in this committee, makes you acquainted with that whole park situation, that we have evolved a series of parks, a great horseshoe which more and more will be used by our people.

Coming out through the Rocky Mountain Park, up through Wyoming, there will be a straight road, and a good road, which will be a better road up into the Yellowstone, then into Glacier, then across to Mount Rainier, then down through Oregon across the Columbia highway to Crater Lake down through California with its great parks across the region of Grand Canyon, and then up into the Mesa Verde.

Then the trip should be extended. If one who was taking this trip would extend it, you would go into the Hawaiian parks. You have set aside two blocks of territory there, one on the island of Hawaii and another on another island, which takes in the grandest scenery of the island, and I expect to see in a year or two, possibly it won't be longer than a year from next summer, the railroads and steamboat companies together make a round trip by which one can leave Washington or New York or Chicago and, taking in the northern tier of parks, go over to the Hawaiian Islands, take those parks in, and come back through these California parks, making altogether a vacation trip lasting five or six weeks in which the great parks will be visited.

That is a great resource. We don't appreciate just what it means to us in money. But we are going to keep in the United States hundreds of millions of dollars every year by reason of having those parks. Switzerland has been supported for years by her tourists' travel. We can not have too many real attractions of that kind.

Probably $100,000,000 would not be an exaggeration of the amount of money from the United States that normally goes into Switzerland in a year. Let us keep the great body of that money at home. It all tends, of course, to develop the life and the neighborhood of the parks. Therefore this whole park scheme is one that makes for a self-contented and self-sufficient United States, and that is the thing that interests the Public Lands Committee particularly.

We are doing our best to develop the minerals so we won't be dependent on other countries, to develop our lands of all kinds, and the native parks system is just one of the resources of the United States that we wish more appropriately to develop.

I do not believe there is any danger of taking from anybody anything of real value by putting this land into a park. I know that we can protect the watersheds. I think, too, there is a probability if this is made the Roosevelt National Park and extended as is proposed up into the very heart of the mountains that you will find the Roosevelt enthusiasts of the country very willing to make large contributions to the building of roads into that section. Those men who were enthusiastic over him would make contributions for the creation of roads that would make this accessible.

[House Report 1063, part 2, Sixty-fifth Congress, third session.]

ROOSEVELT NATIONAL PARK.

February 19, 1919.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. Cramton, from the Committee on the Public Lands, submitted the following minority views (to accompany S. 2021).

January 16, 1919, the Senate passed S. 2021, "to add certain lands to the Sequoia National Park, Calif., and to change the name of said park to Roosevelt National Park," as the title of the bill so well expressed it.

That bill having been referred to the Committee on the Public Lands of this House, report has now been made by the majority of said committee, eliminating entirely the proposed enlargement of the park. As reported from the committee, the bill becomes one simply to change the name of the Sequoia National Park to the Roosevelt National Park.

From that action a minority of the committee dissents. I believe the park should be enlarged substantially along the lines proposed to preserve for, make known to, and make accessible to America and the world some of this continent's greatest scenic wonders and to devote to the people a most wonderful playground and recreation region.

Further, the universal desire to mark indelibly for all time so that posterity ever may know the present-day appreciation of Theodore Roosevelt and his life as a man, a statesman, and a lover of the great outdoors, that desire can fitly be expressed by the creation of this great park as proposed in the Senate bill. But the action proposed by the committee, simply changing the name of an existing park already appropriately named for the great trees and the great Indian, Sequoyah, would fall so far short of the national desire as to be most inappropriate.

Therefore, this minority respectfully indorses the bill as passed by the Senate and recommends its passage by the House.

THE SEQUOIA NATIONAL PARK AND THE PROPOSED ROOSEVELT NATIONAL PARK.

By acts of Congress approved September 25, 1890 (26 Stat., 478), and October 1, 1890 (26 Stat., 650), certain public lands in the State of California were withdrawn from disposal under the public-land laws for the primary purpose of

protecting from destruction the timber growing thereon. The latter act expressly stated that the lands would be set aside as a forest reservation. Some of the lands so reserved were subsequently incorporated in the Sequoia National Park, which now has an area of approximately 161,000 acres. It is proposed, in S. 2021, to extend the boundaries of this park so as to embrace an area of approximately 1,027,000 acres by adding thereto approximately 866,000 acres now in the Sequoia and Sierra National Forests.

In brief, as stated by the Secretary of Agriculture, the bill proposes to extend the national park eastward across the Kern River to Kern Peak, thence north along divides to the crest of the Sierra Nevada Mountains, and northward and westward along the crest of the Sierras, a distance of approximately 74 miles, as the crow flies, from Kern Peak to a point designated on the map as Pine Creek Pass. The bill would also change the boundary by extending the west boundary of the present park northward across Kings River just below the junction of the South Fork and Middle Fork, thence following the divide between Middle Fork and the North Fork of Kings River to the head of the North Fork, and then by various meanders to Pine Creek Pass, the whole having the general form of a triangle, with the base resting along the present south boundary and the apex at Pine Creek Pass.

Of the park thus proposed, Hon. Franklin K. Lane, Secretary of the Interior, says in his letter of May 15, 1918, to the chairman of the House Committee on the Public Lands, reported in full in the minority report:

> Scenically this country is unexcelled, of its kind, in the United States. Its eastern boundary follows the crest of the Sierra Nevada Mountains, from a point 55 miles below the Yosemite National Park's southern boundary southward to and including the climax of the Sierra, which is the mountain grouping in the neighborhood of our loftiest summit, Mount Whitney. In kind it is similar to Yosemite, but differs materially in variety, in climax, and particularly in the extraordinary massing of the peaks. Its small glaciers are many. Its granite cirques have unusual size and majesty. Lofty precipices abound. Interesting volcanic phenomena add to its picturesqueness and scientific significance. I know of no country of similar magnificence whose fastnesses can be penetrated and enjoyed with similar comfort, because of the practical absence of rain during the summer months. Few trail travelers carry tents.
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> The slopes falling from this crest to the western boundaries of the proposed addition have equal distinction. This is an area of tumbled cross ranges holding between them canyons of exceptional wildness and charm. The number and variety of lakes is the traveler's constant surprise. The rivers formed by the confluence of innumerable cascading streams pass through gorges, several of which are comparable in magnificence only to the Yosemite Valley. "There are many Yosemites," writes Muir, and the several next in order of beauty are surely here. For sheer grandeur Tehipite may even exceed Yosemite. The rock walls of the Tehipite Valley and the Kings River Canyon frequently exceed Yosemite's in height. Those of Kern Canyon, Paradise Valley, and Fish Valley are only a little less. Tehipite Dome, the Grand Sentinel, and other outstanding rocks bear scenic comparison with Yosemite's greatest rock features and are likely to become as celebrated.
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> I use the comparison only because of public familiarity with Yosemite. This country is no repetition. It is highly individual and different. But even if it were repetition, a sound reason for this additional reservation would still exist. The generation is not far ahead which will need two Yosemites for its use and pleasure.
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> Finally, there is a reason founded upon proportion and relationship. It seems to me that there is a peculiar fitness in adding to the distinction of Sequoia's forests of giant trees the further distinction of this colossal massing of mountains and of these extraordinary canyons. The common note is apparent. To unite them is to complete a whole, to create a national park in the superlative degree.

The Senate report, by Senator Phelan, says:

> This area which, united with the present Sequoia National Park, * * * constitutes a total of supreme scenic magnificence. It would make a national park unexcelled even in America for sublimity and unequaled anywhere for rich variety. It is penetrated by trails, and affords, with its three foaming rivers, its thousands of streams, its hundreds of lakes, its splendid forests, occasional meadows, castellated valleys, inspiring passes, and lofty glacier-shouldered summits, the future camping-out resort of many thousands yearly.

Those expressions come from most honored sons of California. But among those from the East who have personally visited this region is Hon. Frederick H. Gillett, of Massachusetts, distinguished Member of this House. Speaking in the House January 14, 1919, he said in part:

> Three years ago I went through this Sequoia National Park and the King and Kern Valleys. We went in, out of reach of the telegraph or the mail, with a pack train and I spent there two of the most interesting and healthful weeks of my life. I do not suppose it is possible to compare different beauties of nature according to their relative excellence, but if there is any finer scenery in the world than this I should like to see it. But until I have seen it I shall be skeptical about it and be satisfied with the wonderful picturesqueness and variety of the valleys and gorges and mountains and chasms and streams of this extraordinary region. It did not seem to me it was useful for anything except a great camping-out place for the American people. Possibly a few sure-footed animals might get grazing there, but it was apparently created as a grand aggregation of scenic beauty, where tired man could refresh and enjoy himself.

The Secretary of Agriculture, Hon. D. F. Houston, says in his report on this matter December 30, 1918:

The immense area which it is proposed to transfer from the national forest to the national park is known to contain a number of scenic features of first rate importance, the most notable being Mount Whitney and the canyon of the South Fork of Kings River. Unquestionably these two features are chiefly valuable for their scenic interest and should be retained and administered with a view to make them available for the instruction and entertainment of the public.

In his statement before this committee Mr. Gilbert Grosvenor, editor of the National Geographic Magazine, said in part:

The area that we saw—I have been all through Switzerland many times, and in my judgment Switzerland can't compare with it. We counted at least 100 waterfalls that if they were in Switzerland would have become celebrities.

There is another point of view. When you go to bed in Switzerland at night you don't know whether the rain will allow you to see any scenery the next day. You may stay there a week without seeing a mountain top. I did. You go out to the Sierra and you are absolutely sure, so far as the weather is concerned, of getting the worth of your railroad fare repaid you in the scenery.

From an educational point of view, no section of America compares with the Sequoia. The number and variety of the trees are extraordinary. The number of Nature's exhibits is extraordinary. All of the geological area is extraordinary. This area will never be developed unless you develop it. I have great respect for the Forest Service, but its province is not to develop natural scenery. It can't, because its functions are different. If this area is going to be developed for the public it can only be done as a national park.

I have come here at Mr. Mather's request to express the hope of the National Geographic Society, which has a membership of over 700,000, that this area will be added to the national park systems and that it will be called by a name that will not be a misnomer; and if you are going to give it a new name you could not suggest a better name than Mr. Mather has suggested. * * *

It's finer than Switzerland, and as an American I hate to see tens of thousands of my fellow countrymen going to Switzerland every year before seeing America. * * *

And we won't be real Americans until we see the West. These magnificent birds that are in this park, and the wonderful trees—why, you see trees there that make the biggest trees in the Alps look like a cane or a toothpick.

Mr. Emerson Hough, the noted author, who appeared before the committee, said in part:

All the things I make my living out of and the things I love most have been principally matters connected with the out-of-doors; things that are fairly American; the western country. I can say without any personal bias in the matter at all, that I have seen all the passes and parks in this country and clear up to the Arctic Ocean, and, in the course of my profession, I have traveled through all these parks for the Saturday Evening Post and have written a series of stories about them.

I have been in Switzerland and through Europe, and I can add to this testimony that you have already heard here that there is no country on the face of the earth that compares with the country in this proposed park. There isn't anything that you need to say about it further, and there isn't any man on this committee or on the floor of the House who would vote against this bill if he had seen something of the country out there and appreciated its beauty.

The magnificent scenic worth of the proposed enlargement is not disputed anywhere. The action of the majority of the committee in abandoning entirely the proposed increase is stated in the report to be based on the fact that "there is some controversy between the Department of the Interior and the Department of Agriculture as to the proper boundaries."

The controversy in question does not appear to be serious, and so far as any lack of unity exists it only refers to minor details of the project and does not in any way relate to the merits of the great project itself. The Department of Agriculture, which has had the question before it for considerable time, asks delay to permit a field examination to pass on questions of boundaries. Having stated that the immense area to be transferred from the jurisdiction of the Forest Service in the Department of Agriculture to the National Park Service in the Interior Department "is known to contain a number of scenic features of first-rate importance * * * which should be retained and administered with a view to make them available for the instruction and entertainment of the public," the Secretary of Agriculture then states:

At the same time, this area marked is known to contain considerable bodies of timber, aggregating, it is estimated, some two billion feet, as well as a large area of grazing land, now in use under national forest regulations, which is important to the local communities. It is apparent that the future use of these economic resources must be given very careful consideration in planning for the administration of the areas and in determining whether or not it should be transferred from the national forest. The presence of these important natural resources now under use by the local communities, and the bearing which this transfer will have upon the future administration of the two national forests, makes it impossible for this department to approve the boundary as proposed in advance of a thorough field examination upon the ground.

The information furnished the committee by the department which has had jurisdiction of these areas many years is limited to the confirmation of the

scenic worth of the section, and the statement that "this area is known to contain considerable bodies of timber aggregating, it is estimated, some 2,000,000,000 feet, as well as a large area of grazing land now in use under National Forest Regulations, which is important to the local communities."

As to the timber estimate, even if correct, the amount is not sufficiently large to be of controlling importance in connection with the inclusion of 1,200 square miles of natural scenery.

The statement as to grazing lands is indefinite, but the hearings indicate clearly that their extent is also negligible in comparison with the total.

Secretary Lane states in his report to the committee:

> There is little opportunity for commercial development of this region. Much of it is far above timber line, and practically no part of it lies below the 7,500-foot contour line. It is useless for farming purposes, although the mountain meadows are largely utilized for the pasturage of live stock during the summer months.
>
> The region is not accessible longer than four months of the year. The snowfall is heavy in winter. It closes the passes early in autumn and opens them by its disappearance late in the spring. Magnificent as it is in the summer months, when this region can be visited and enjoyed by the lover of the mountains, it is a forbidding land at all other times.
>
> There is some merchantable timber on the outskirts of the territory covered by this bill, but it should be preserved to protect the watersheds of the rivers and creeks and to complete the scenic features of the park. Part of this timber is of the giant Sequoia species, two fine groves of these great trees standing only a short distance from areas now being cut over. It is unnecessary to remark that this timber should be safeguarded forever.

Before the committee, Director Mather stated:

> Two-thirds of that country is practically a treeless country. Lots of it is above timber line. We shall be able to show you photographs of the country itself so as to convince you that it is not one that could be commercially exploited.

As to the grazing lands, not only is the availability of this great area for that purpose very limited, but the inclusion of the region in a national park does not necessarily interfere with such use, so far as nature permits. To quote again from Secretary Lane's report:

> Under section 2 of the bill, water power and grazing permits may be granted where the development of power and the use of park lands for the pasturage of cattle "is not detrimental to the primary purpose for which the park was created." This section refers to the national park service act of August 25, 1916 (39 Stat., 535), which in section 4 specifically provides that nothing therein shall affect the act of February 15, 1901 (31 Stat., 790).

Director Mather states (hearing, p. 11):

> We have brought out clearly that we had no intention of interfering with reasonable pasture rights, but that we do propose to plan relatively small fenced pastures for the benefit of tourists. We recognize thoroughly that the cattlemen have certain rights in that section. They have their drift fences, telephone lines, and their little cabins and it would be a mistake to wipe them out. We have no such intentions. Our treatment of cattlemen was best shown by the way we took care of them in the Yosemite and Sequoia Parks last season, when, at the Secretary's request, we gave them large privilege of using those parks as a war measure.

Furthermore, the Interior Department is on record in the letter of Acting Secretary Vogelsang (p. 7 of the committee hearings):

> The lands proposed to be added to Sequoia National Park are to be administered under the national park service act of August 25, 1916, and you will recall that this law specifically authorizes the granting of permits for the grazing of live stock in the national parks where such use is not detrimental to the primary purpose for which these reservations were established.

Among the most active advocates of the measure are some of those who have heretofore had the largest grazing interests in the region affected.

No substantial reason, therefore, appears for delay in the addition of this wonderful region to our national-park system. On the other hand, the warning of Secretary Lane may well be heeded:

> There is danger that private rights may be acquired in strategic portions of this territory, owing to the fact that such rights are now obtainable within national forests. For any portion of the floor of the main Kings River Canyon, Tehipite, and Paradise Valleys, and other Yosemitelike valleys, to be acquired by private interests to the exclusion of the public would be a serious national loss. At the present time, fortunately, there are comparatively few private holdings in the region.

THE CHANGE OF NAME.

If Congress sees fit to change the Sequoia National Park as herein suggested, the name "Sequoia," characteristic and fitting for the existing park, ceases to be so and a new name is proper. It is easy to foresee, however, that always the name "Sequoia" will attach to the giant-tree region in the park.

For the new and enlarged park the name Roosevelt was first suggested by the Boone and Crockett Club, of New York City, and has been enthusiastically indorsed everywhere.

Of this Secretary Lane has well said:

"It has been in mind a long while that this Sequoia Park should be extended. This is the natural extension of it. This development is going to take place sometime. It might just as well take place now. The name that is suggested for the park, naming this the Roosevelt Park, particularly appeals to me, and particularly, I think, appeals to the West. It would be a graceful thing on the part of this Congress, especially as it is a Democratic Congress, to give this vast monument a name after a man who took so much interest in the West.

"Without regard to partisanship, we regard Roosevelt as a western man. He lived part of the time in the West. He took a deep interest in it. He spoke its language. There was a sort of directness and a bluntness and forthrightness about the man's virility and strength that particularly appealed to our western people. There is nothing probably that we could do that would more properly fit in with the character of the man than to take these high, rugged mountains of the far West and name them after him. It would be an appropriate monument to the man who loved the open places in all parts of this country.

"He is going to be known as a sort of boys' hero. He is going to be known preeminently for his manliness. There is going to be a Roosevelt legend. He is the kind of man that legends like to play with. He is the kind of man that the sagas and iliads and idylls have been written about, because they have not been written about men who have not got the directness and expressiveness of the primal man, the man who has this ruggedness and strength and personal prowess and endurance; and we will find as time goes on that that quality in him will be emphasized, and that will make him in course of time the real boys' hero, and there is no truer fame than that.

"Now, I say that this is a good time to dedicate this area as a national park, and it is very appropriate that that area should be named after that man whose very spirit this section of the country represents."

It is the wish of the Nation to commemorate the name of Roosevelt in a way that will speak plainly to generations to come our appreciation of the splendid service he rendered this country in private station and in public. Such a wish to commemorate does not come grudgingly, but forcefully, from the hearts of the people, and our response should be in keeping.

From across the seas has come this tribute from the pen of Kipling, giving most effective expression to the estimate of Roosevelt in the hearts and minds of mankind:

GREAT-HEART.

[A poem dedicated to the memory of Theodore Roosevelt, apropos of Roosevelt Memorial Day. By Rudyard Kipling. Copyright 1919, by Rudyard Kipling.]

The interpreter then called for a man servant of his, one Great-Heart.—*Bunyon's Pilgrim's Progress.*

Concerning brave captains
  Our age hath made known
For all men to honor,
  One standeth alone,
Of whom o'er both oceans
  Both peoples may say:
"Our realm is diminished
  With Great-Heart away."

In purpose unsparing,
  In action no less,
The labors he praised
  He would seek and profess
Through travail and battle,
  At hazard and pain;
And our world is none the braver
  Since Great-Heart was ta'en.

Plain speech with plain folk,
  And plain words for false things,
Plain faith in plain dealing
  'Twixt neighbors or kings
He used and he followed,
  However it sped;
Oh, our world is none more honest
  Now Great-Heart is dead.

The heat of his spirit
  Stuck warm through all lands;
For he loved such as showed
  'Emselves men of their hands,
In love, as in hate,
  Paying home to the last;
But our world is none the kinder,
  Now Great-Heart hath passed.

Hard-schooled by long power,
  Yet most humble of mind
Where aught that he was
  Might advantage mankind.
Leal servant, loved master,
  Rare comrade, sure guide;
Oh, our world is none the safer
  Now Great-Heart hath died.

Let those who would handle
  Make sure they can wield
His far-reaching sword
  And his close-guarding shield;
For those who must journey
  Hence forward alone
Have need of stout convoy
  Now Great-Heart is gone.

To commemorate that great spirit that has gone from us this great park should be created and given the name "Roosevelt." It will be one of the world's greatest parks. The man who bore the name proposed for it was one of the world's greatest for all time.

[Excerpt from Congressional Record, January 13, 1919.]

SENATE.

* * * * * * *

The Roosevelt National Park.

Mr. PHELAN. Mr. President, I have introduced a bill in this body, Senate bill 2021, which provides for the creation of a national park in California, to embrace the famous Kings River Canyon and groves of giant trees, admittedly the most surprising and wonderful stretches of the national domain, open to all the people at all seasons of the year for health, recreation, and aesthetic gratification. The amendment I now move provides that this area shall be, when created into a park, designated in honor of our late and beloved President, the Roosevelt National Park. I have consulted the Secretary of the Interior, Hon. Franklin K. Lane; Stephen T. Mather, the Superintendent of National Parks; and Representative Elston, of California, who are all of one mind on this subject—that no more fit designation could be made.

Theodore Roosevelt was early identified with the West, and the west of the West. He sought among the great mountain ranges and the vast expanse of the prairie a field for his abounding energy. From his narrow environment of city streets and congested population he naturally sought expansion. The liberalizing influences of the western life nationalized him, prepared him, as it were, for the larger tasks which he was destined to pursue. I can not imagine a more fitting memorial for a man of his tastes, courage, generous nature, and love of the beautiful than the wild, rugged, and sublime scenery embraced in central California. Here is the Kings River Canyon, than which no equal area on earth is its superior in natural wonders. The story of William Tell might apply with equal pertinency to Theodore Roosevelt, who learned his love of liberty from his love of nature, and like the mountain streams, plowed the valleys without asking leave, or like the mountain peaks, wore their caps of snow in the very presence of the regal sun. This park is bounded by the crests of the high Sierra, and cataracts leap in glory from altitudinous clefts. The giant trees lift their heads far above the inclosing fog, erect amidst tempests, resplendent in the light of day. California—a State richly endowed by nature—can dedicate no finer monument to the memory of Roosevelt than this, the choicest of her natural gifts.

The PRESIDING OFFICER. The amendment will be referred to the Committee on Public Lands.

[Excerpt from Congressional Record, January 14, 1919.]

HOUSE OF REPRESENTATIVES.

* * * * * * *

Mr. ELSTON. Mr. Chairman, I simply wish to detain the House for a moment to make mention of a bill which I introduced on yesterday following the introduction in the Senate of a similar bill by Senator Phelan, of California. It has for its object the changing of the name of Sequoia National Park in California to "Roosevelt National Park."

The suggestion was made by Mr. Lane and by Mr. Mather, the Director of National Parks. The proposed park is an enlargement of the smaller park heretofore called the Sequoia National Park. The greater park, when it is authorized by Congress, will include some wonderful scenic features; not only the largest grove of Sequoia gigantea, the largest trees of the world, but it will also include the great canyon of the Kern and Kings Rivers, as well as the tremendous Alpine Meadows; and it will also include the highest point of continental United States, Mount Whitney. I think it is extremely fitting that this great park, which includes some of the most magnificent scenic features in

the world, should be named after Theodore Roosevelt. It has in many of its aspects the grand features which are characteristic of Roosevelt himself.

I thought it proper to direct the attention of the House to the fact that this bill has been introduced and may come up for consideration before long. (Applause.)

* * * * * * *

Mr. GILLETTE. Mr. Chairman, I simply wish to indorse the statement which the gentleman from California has made. Three years ago I went through this Sequoia National Park and the Kings and Kern Valleys that he speaks of. We went in, out of the reach of the telegraph or the mail, with a pack train and I spent there two of the most interesting and healthful weeks of my life. I do not suppose it is possible to compare different beauties of nature according to their relative excellence, but if there is any finer scenery in the world than this I should like to see it. But until I have seen it I shall be skeptical about it and be satisfied with the wonderful picturesqueness and variety of the valleys and gorges and mountains and chasms and streams of this extraordinary region. It did not seem to me it was useful for anything except a great camping-out place for the American people. Possibly a few sure-footed animals might get grazing there, but it was apparently created as a grand aggregation of scenic beauty, where tired man could refresh and enjoy himself. As the gentleman from California (Mr. Elston) has said, it is very desirable that the present Sequoia Park should be enlarged so as to include this neighboring tract of wonderful scenery, and then nothing could be more appropriate than to name the whole after such a lover of nature as Theodore Roosevelt. (Applause.)

[House Report No. 938, Sixty-fifth Congress, Third Session.]

ADDITION OF CERTAIN LANDS IN WYOMING TO THE YELLOWSTONE NATIONAL PARK.

January 16, 1919.—Committed to the Committee of the Whole House on the state of Union and ordered to be printed.

Miss Rankin, from the Committee on the Public Lands, submitted the following report (to accompany H. R. 13350).

The Committee on Public Lands having considered H. R. 13350, a bill to add certain lands to the Yellowstone National Park, direct the reporting of the same without amendment and with the recommendation that it be passed.

At the time the Yellowstone National Park was established, comparatively little was known in regard to the general region outside of the locality of Yellowstone Lake and Canyon and the main geyser basins, and the entire region was unsurveyed and had never been carefully mapped. The boundaries as established included the then known features of interest, but were necessarily artificial rather than natural.

As time passed, it came to be generally recognized by those familiar with the region and interested in the maintenance of this remarkable section of our country as a great national resort and pleasure ground, that the park should be extended to the south and southeast, in order to include in the park certain remarkable scenic features so located as to be logical and essential features of the park and with a view of establishing in that section the natural boundaries of this remarkable region of mountains and lakes, geysers, waterfalls, and canyons.

While Nature has fixed and established these natural boundaries, there has been some difference of opinion as to the limits which should be fixed for the park extension. Continued discussion of the subject and repeated examinations by officials of the Interior and Agricultural Departments, and conferences with those locally and generally interested in the subject, has finally resulted in a practically unanimous agreement on the boundaries described in this bill.

The addition proposed is approximately 60 miles in extreme length east and west, immediately south of the present park boundary, and approximately 30 miles in extreme width north and south along the summit of the Teton Range. The added area is about 6 miles wide north and south on the Wyoming boundary and nearly 20 miles wide east of Jackson Lake and along the Buffalo Fork of the Snake River.

The lands added to the park embrace an area of 409,600 acres, or 1,265 square miles, as compared with the present area of 2,142,720 acres, or 3,348 square miles. Of the area proposed to be added to the park 1,889 acres are patented and there are pending entries of various kinds covering 2,704 acres. There are also 1,638 acres of school lands belonging to the State of Wyoming, but these

lands have all been offered by the State as the basis of pending indemnity school selections and will pass into the ownership of the Government as these selections are approved.

All of the lands proposed to be added to the park are now in forest reserves, and all but a limited portion of them are in State game reserves. The lands proposed to be included have been utilized to but a very limited extent for the grazing of live stock. They have been retained in the main as a feeding ground for the great elk herd, which inhabits the park and the surrounding territory, and a very considerable herd of moose, as well as deer, mountain sheep, etc. The enactment of the legislation will not, therefore, affect the present situation with regard to live-stock grazing, as under the terms of the bill the Secretary of the Interior is authorized to issue permits for the grazing of live stock, not in excess of the limited grazing which has heretofore been allowed and under proper restriction. The bill also makes provision for the grazing, under proper regulation, of such number of live stock owned by landowners within the included area "as they have been accustomed to graze in the past or as may be reasonably necessary to the use and utilization of their lands."

The important outstanding features of the area added to the park are the Jackson Lake, the cluster of lakes at the foot of the Teton Range, the Thorofare Basin area, constituting the headwaters of the Yellowstone River, the Continental Divide, and the Two Ocean Pass, and the eastern slope of the majestic Teton Range—the most typically alpine range within the continental boundaries of the United States, whose sheer glacier polished peaks rise to an elevation of more than 14,000 feet above sea level. The addition of these areas to the park bring within its boundaries these game sections and wonderful scenic features necessary to round out and perfect the park as the greatest of our national parks and game preserves.

There is appended to, and made a part of this report, reports of the Secretary of the Interior and the Secretary of Agriculture, approving and recommending the passage of the bill. Also a statement prepared by the Interior Department, giving a list and the status of patented land, pending entries, and pending indemnity school bases.

DEPARTMENT OF THE INTERIOR,
Washington, December 27, 1918.

DEAR MR. FERRIS: I have received your request of December 17 for a report on H. R. 13350, a bill to add certain lands to the Yellowstone National Park. This measure proposes to add to the Yellowstone National Park a part of the Jackson Hole region of Wyoming lying immediately south of the park, and the headwaters of the Yellowstone River, including Thorofare Basin south and southeast of the park.

The boundaries of the territory involved in this addition are clearly indicated on the map attached hereto. All of the land affected by this legislation is within the State of Wyoming, and all of it except the tract west of the Teton Mountains and an area immediately south of the park in the region of the Upper Yellowstone has been included in State game preserves for several years. This territory is also a part of the Teton and Targhee National Forests.

The total area of the proposed addition is 1,265 square miles. The area of the park as at present constituted is 3,348 square miles.

This legislation has my unqualified approval and I recommend it to the favorable consideration of the Congress. There are four sound reasons why it should be enacted into law immediately:

(1) The magnificent natural features of the Jackson Hole and Upper Yellowstone regions are needed to diversify and complete the scenery of the park. Yellowstone Park is in the Rocky Mountains, yet it is in no sense typical of the Rockies. It is an accidental volcanic region in an advanced state of decline; its lava cones are lowered by erosion; its outlines tend toward rolling levels. In the proposed addition the Teton Mountains rise above a chain of beautiful lakes. This is a granite range typical of the magnificence of the Rocky Mountains in supreme manifestation. Several peaks, including the Grand Teton and Mount Moran, rise nearly 14,000 feet above the sea and 7,000 feet above the lakes and forests at their bases. The Tetons are a sublime example of what the Yellowstone was; they complete the spectacle. Together these regions are not only wonderfully contrasted and profoundly spectacular; they are also highly educational. Apart from the magnificence of this controlling feature, however, the proposed addition has many national park qualities. The Snake River, at the outlet of the Jackson Lake reclamation dam, is one of the finest trouting waters on the continent. Every turn and reach of the valleys of Pacific Creek, leading southwest from the Continental Divide at Two Ocean Pass, and the Buffalo Fork of the Snake, command the Teton view. The valley of Atlantic Creek, which flows from Two Ocean Pass northward into the Yellowstone, and the splendid upper valley of the Yellowstone River itself, now a wilderness, are other features of the extension plan.

(2) The proposed addition will afford a large measure of protection to the wild animals of the park region and especially to the herds of elk and moose. Much of the summer range and breeding ground of the elk is within the suggested new boundaries of the park, and the moose wander over a large part of the area in winter. While most of this territory is now in a State game preserve, and its wild life is cared for by State wardens and forest rangers in accordance with State law, it is constantly subject, in its existing status, to unfavorable State legislation and other regulation incompatible with the interests of the park. The tract of land mentioned above, several thousands of acres in extent, lying immediately south of the present boundary of the park, was opened to hunting in 1917. This is in the heart of the summer range of the elk and these animals.

fearless of men because long protected in the mountain fastnesses, fall easy prey to the hunter. Furthermore, there is constant danger of poaching in the park, because no natural boundary marks the park line in this region, and it is exceedingly difficult to protect the arbitrary boundary. From the standpoint of wild life conservation, therefore, this project is of great importance.

(3) The logical and proper development of Yellowstone Park as a great touring resort can not be carried out unless this extension plan is adopted. Ultimately a road must be built along the eastern shore of Yellowstone Lake into the Upper Yellowstone region, thence over Two Ocean Pass and down Pacific Creek to Jackson Lake, thus completing the automobile road system of the park. This route is perfectly practicable for a highway that would rank with the great scenic roads of the world. Extension of the hotel and permanent camping systems of the park into this region is also highly desirable. This can only be accomplished by bringing it under the control of the National Park Service.

(4) The south line of Yellowstone Park should be a natural boundary that could not under any circumstances be mistaken. No better natural boundary could be designated than that described in the pending bill—the hydrographic divide north of Boone Creek, the crest of the Teton Range, the Snake River and the Buffalo Fork, the Continental Divide for a short distance, then the crest of the Absaroka Range to the east boundary of the present park. This boundary could be quickly and efficiently controlled by park rangers, whereas the present south boundary can not be guarded satisfactorily at any time of the year. It would be distinctly in the inerest of economy and good administration to establish the new line.

Furthermore, it should be observed that Congress has already recognized that the land embraced in this project naturally belongs to Yellowstone Park in its appropriations of funds for the maintenance of the roads through this region as a part of the national park highway system. See the sundry civil acts of August 1, 1914 (38 Stat., 632); March 3, 1915 (38 Stat., 845); July 1, 1916 (39 Stat., 288); June 12, 1917 (40 Stat., 105, 132), and July 1, 1918 (Public No. 181, 65th Cong.).

The additional expense of maintaining and protecting the enlarged park will require only a slight increase in the appropriations for the park, whereas the traveling public will derive tremendously more benefit and pleasure rom its use of the park region than is possible at the present time.

There are few private holdings in this territory. The patented entries cover 1,889.18 acres, the pending entries 2,704.44 acres, and the lands offered as base of pending indemnity school selections 1,638.37 acres, a total of 6,232.37 acres. The rights of the settlers on these lands are fully protected by the pending bill. A statement showing the status of the lands affected by private ownership or other interest is forwarded herewith.

I have no criticism to make of the form or substance of the bill, and I recommend that it be taken up for early consideration with a view to its passage in the near future. It is exceedingly meritorious.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

Hon. SCOTT FERRIS,
Chairman Committee on the Public Lands, House of Representatives.

DEPARTMENT OF AGRICULTURE,
Washington, December 31, 1918.

Hon. SCOTT FERRIS,
Chairman Committee on the Public Lands,
House of Representatives.

DEAR MR. FERRIS: Receipt is acknowledged of a copy of the bill H. R. 13350, to add certain lands to the Yellowstone National Park, with request that your committee be sent such suggestions as this department may desire to make.

During October the forester, Col. Graves, made a visit to the region to form a personal judgment regarding the proposed addition, and also to see how this addition would fit in with contemplated plans for the conservation of the herds of elk in that region. Col Graves has reported in favor of making the addition. The majestic Teton Mountains, rising abruptly above the valley, with a series of lakes lying along the base of the chief mountain mass, constitute a scenic feature of unusual interest. Its close proximity to the Yellowstone Park makes it a natural objective for visitors and a worthy feature for scenic development as a part of Yellowstone Park. The addition of the Teton Mountains should also carry with it the addition of the areas on Pacific Creek and the headwaters of Yellowstone River.

In previous reports of this department reference was made to the large amount of timber within the area. It is true that the aggregate of timber is very large. While it would undoubtedly be possible later on to develop certain bodies of timber, the time for such a development is uncertain, and it is not believed that there will be any serious embarrassment from an economic standpoint in withholding this timber for national park purposes.

In view of the facts as brought out by the personal visit of the forester, this department is glad to join the Interior Department in an affirmative recommendation for the addition of the areas proposed in the bill.

Very truly, yours,

D. F. HOUSTON, *Secretary.*

List giving status of lands in proposed addition to Yellowstone National Park, Wyo., May, 1918.

A. PATENTED ENTRIES.

	Acres.
In T. 46 N., R. 115 W.:	
Sec. 15: SE. ¼ SE. ¼ and lot 6, H. E. 1632, August 16, 1904; F. C. 1024 (Lander), January 14, 1905; canceled by relinquishment as to parts of lots 1, 2, and 3, sec. 22, and part of lot 6. September 18, 1907; John D. Sargent, patented March 23, 1908	160. 61
Sec. 22: Lots 1, 2, and 3, H. E. 1632. (See sec. 15.)	

	Acres.
In T. 45 N., R. 114 W.:	
Sec. 13: S. ½ S. ½ NW. ¼, N. ½ N. ½ SW. ¼, H. E. 04251 (see sec. 14)	80.00
Sec. 14: S. ½ SE. ¼ NE. ¼, NE. ¼ SE. ¼, N. ½ SE. ¼ SE. ¼, H. E. 04251, July 30, 1914; F. C. 04251 (Evanston), December 13, 1916; Elmer C. Arthur, patented June 9, 1917 (see sec. 13)	80.00
Sec. 17: SE. ¼ NW. ¼, SW. ¼, NE. ¼, lots 3 and 4, Dt. E. 191, December 23, 1897; F. C. 137 (Lander), March 9, 1901; Charles J. Allen, patented June 29, 1901	160.00
Sec. 17: SW. ¼ NW. ¼, NW. ¼ SW. ¼, lots 2 and 6; H. E. 297, August 28, 1896; F. C. 1164 (Lander), December 7, 1905; Edward Smith, patented June 15, 1911	135.91
Sec. 18: Lots 4, 5, 6, and 7, H. E. 390, December 31, 1897; F. C. 473 (Lander), September 16, 1903; Frank V. Lovell, patented April 4, 1904	129.76
In T. 45 N., R. 114 W.:	
Sec. 20: SW. ¼, coal cash entry 226 (Evanston), November 3, 1906; Emma D. Johnson, patented May 5, 1910	160.00
Sec. 25: SE. ¼, H. E. 01586, March 15, 1909; F. C. 01586 (Evanston), August 3, 1912; Samuel Gregory, patented April 4, 1913	160.00
Sec. 29: NW. ¼ SW. ¼, lot 5, H. E. 01744 (see sec. 30)	80.00
Sec. 30: SE. ¼ SE. ¼, lot 7, H. E. 01744, July 12, 1909; F. C. 01744 (Evanston), January 14, 1916; George E. McClure, patented July 11, 1916	85.61
Sec. 30: SE. ¼ NW. ¼, lots 2, 4, and 5, H. E. 1626, August 8, 1904; F. C. 1025 (Evanston), January 21, 1905; Noble Gregory, patented March 8, 1907	174.44
Sec. 30: N. ½ SE. ¼, S. ½ NE. ¼, H. E. 01882, September 24, 1909; F. C. 01882 (Evanston), October 13, 1913; Walter J. German, patented April 7, 1914	160.00
Sec. 21: W. ½ NE. ¼, lots 1 and 2, H. E. 0389, September 19, 1908; F. C. 0389 (Evanston), September 17, 1914; Charles M. Neil, patented August 11, 1915	163.07
Sec. 24: N. ½ SE. ¼, H. E. 1627, August 8, 1904; F. C. 1029 (Evanston), January 28, 1905; William C. Randolph, patented February 10, 1910. (See sec. 19, T. 45 N., R. 112 W.)	80.00
In T. 45 N., R. 112 W.:	
Sec. 19: NE. ¼ SW. ¼, lots 3, H. E. 1627 (see sec. 24, T. 45 N., R. 113 W.)	79.78
Total number acres patented entries	1,889.18

B. PENDING ENTRIES.

In T. 45 N., R. 114 W.:	
Sec. 8: N. ½ NE. ¼, SW. ¼ NE. ¼, NW. ¼ SE. ¼, H. E. 05426 (Evanston), April 24, 1916; Charles R. Christian	160.00
Sec. 7: E. ½ SE. ¼ SE. ¼, H. E. 04620 (see sec. 18)	20.00
Sec. 8: S. ½ SW. ¼ SW. ¼, W. ½ SE. ¼ SW. ¼, H. E. 04620 (see sec. 18)	40.00
Sec. 17: NW. ¼ NW. ¼, H. E. 04620 (see sec. 18)	40.00
Sec. 18: E. ½ E. ½ NE. ¼, E. ½ NE. ¼ SE. ¼, H. E. 04620 (Evanston), April 10, 1915; George H. Whiteman (see secs. 7, 8, and 17)	60.00
Sec. 13: S. ½ NW. ¼ SW. ¼, SW. ¼ NE. ¼ SW. ¼, NW. ¼ SE. ¼ SW. ¼, SW. ¼ SW. ¼, H. E. 06310 (Evanston), August 14, 1917; William A. J. Snell (see sec. 14)	80.00
Sec. 14: S. ½ SE. ¼ SE. ¼, H. E. 06310 (see sec. 13)	20.00
Sec. 14: SW. ¼ SW. ¼, H. E. 04604 (see sec. 23)	40.00
Sec. 15: SE. ¼ SE. ¼, H. E. 04604 (see sec. 23)	40.00
Sec. 22: NE. ¼ NE. ¼, H. E. 04604 (see sec. 23)	40.00
Sec. 23: NW. ¼ NW. ¼, except strip described by M. & B., H. E. 04604 (Evanston), April 6, 1915, Roy B. Lozier (see secs. 14, 15, and 22)	37.72
Sec. 16: NE. ¼ SE. ¼, lots 5 and 6, SW. ¼ SE. ¼ NE. ¼, S. ½ SE. ¼, SE. ¼ NE. ¼, H. E. 04768 (Evanston), June 1, 1915; Joseph J. Markham (see sec. 21)	159.30

	Acres.
In T. 45 N., R. 114 W.—Continued.	
Sec. 21: Lots 1 and 9, H. E. 04768 (see sec. 16); included in acreage under section 16.	
Sec. 26: Lots 3, 4, and 5 and SE. ¼ SW. ¼, H. E. 05213 (Evanston), November 10, 1915; Joseph S. Chaplin; part in proposed park, approximately	20.00
In T. 45 N., R. 113 W.:	
Sec. 7: S. ½ NE. ¼, W. ½ SE. ¼, H. E. 05732 (Evanston), September 26, 1916; Frank E. Braman	160.00
Sec. 7: SE. ¼ NW. ¼, E. ½ SW. ¼, lot 4, H. E. 05516 (Evanston), May 29, 1916; Harold C. McKinistry	166.54
In T. 46 N., R. 113 W.:	
Sec. 31: Part of, survey by metes and bounds (Evanston, H. E. 03838), October 13, 1913; David Terrin (see sec. 36, T. 46 N., R. 114 W.)	159.94
Amended by "K," January 22, 1917, to include list 4, 1985; appl. to amend. H. E. 03838, filed October 25, 1916. (See sec. 36.)	
In T. 46 N., R. 114 W.:	
Sec. 36: Part of, by metes and bounds, H. E. 03838. (See sec 31, T. 46 N., R. 113 W.)	
Sec. 29: Part of, by metes and bounds, H. E. 04969. (See sec. 32.)	
Sec. 32: Part of, by metes and bounds, H. E. 04969 (Evanston), July 23, 1915; Samuel R. Wilson	159.89
In T. 43 N., R. 116 W.:	
Sec. 2: Part of, by metes and bounds, H. E. 03844, October 15, 1913 (Evanston); Geraldine A. Lucas, part in proposed addition approximately	77.50
In T. 44 N., R. 116 W.:	
Secs. 26 and 35: Parts of, by metes and bounds, H. E. 04667 (Evanston), May 13, 1915; Noritz Locher, part in proposed addition approximately	40.00
In T. 45 N., R. 114 W.:	
Sec. 12: W. ½ NE. ¼, E. ½ NW. ¼, NE. ¼ SW. ¼, H. E. 03574, November 4, 1913; F. C. 03574 (Evanston), July 11, 1917; William C. Thompson	160.00
Sec. 22: S. ½ NE. ¼, SE. ¼ NW. ¼, lots 2, 3, and 4, H. E. 04499, April 5, 1915, F. C. 04499 (Evanston), September 25, 1917; John Brown	157.42
Sec. 23: SE. ¼ SW. ¼, H. E. 04250 (see sec. 26)	40.00
Sec. 26: Lot 1, N. ½ NE. ¼, H. E. 04250, July 30, 1914, F. C. 04250 (Evanston), June 15, 1917; William T. Carter (see sec. 23)	127.50
In T. 45 N., R. 114 W.:	
Sec. 36: W. ½ NW. ¼, W. ½ SW. ¼, H. E. 04263 (Evanston), August 7, 1914; William C. Steingraver, part in this proposed addition	3.00
In T. 45 N., R. 113 W.:	
Sec. 29: S. W. ¼ NE. ¼, S. ½ NW. ¼, lot 2, H. E. 02609, January 30, 1911; F. C. 02609 (Evanston), June 15, 1917; Joseph C. McClure	135.91
Sec. 29: NW. ¼ SE. ¼, NE. ¼ SW. ¼, lots 4, 6, and 8, H. E. 03250, August 3, 1912; F. C. 03250 (Evanston), July 11, 1917; Ben F. Taylor	169.13
Sec. 23: N. ½ SE. ¼, S. ½ SE. ¼ NE. ¼, H. E. 0389 (see sec. 24)	100.00
Sec. 24: S. ½ SW. ¼ NW. ¼, NW. ¼ SW. ¼ (except a strip 20 feet wide), H. E. 03086 (Evanston), April 4, 1912; Nathan Smith (see sec. 23)	60.00
Sec. 24: Part of—strip 20 feet wide—by metes and bounds, H. E. 06377, November 24, 1917; Nathan Smith	1.33
In T. 45 N., R. 112 W.:	
Sec. 20: SE. ¼ NE. ¼, H. E. 04648 (see sec. 21)	40.00
Sec. 21: SW. ¼ NW. ¼, lot 2, NW. ¼ lot 3, N. ½ of lot 8, NW. ¼ of lot 7, H. E. 04648 (Evanston), June 12, 1915; George R. Erwin (see sec. 20)	119.26

	Acres.
In T. 47 N., R. 118 W.:	
Secs. 2, 3, 10, and 11: Parts of, by metes and bounds, H. E. S. No. 101, H. E. 03302 (Evanston), September 9, 1912; F. C. 03302 (Evanston), October 4, 1917; James E. Johnston; within proposed addition approximately	30.00
Secs. 2 and 11: Parts of, by metes and bounds, H. E. S. No. 102; H. E. 05234 (Evanston), November 25, 1915; Milburn W. Porter; within proposed addition approximately	40.00
Total number acres pending entries	2,704.44

C. BASES OF PENDING STATE SCHOOL INDEMNITY SELECTIONS.

In T. 47 N., R. 109 W.:	
Sec. 36: SE. ¼, 015870 (Cheyenne), April 8, 1916	160.00
In T. 45 N., R. 115 W.:	
Sec. 16: S. ½ SW. ¼, 03179 (Evanston), June 18, 1912	80.00
Lot 6, 04469 (Evanston), January 15, 1915	38.75
Sec. 36: NE. ¼ NW. ¼, 03179 (Evanston), June 18, 1912	40.00
NW. ¼ NW. ¼, 07881 (Douglas), January 20, 1915	40.00
SE. ¼ NW. ¼, SW. ¼ NW. ¼, 010955 (Sundance), July 9, 1915	80.00
In T. 44 N., R. 117 W.:	
Sec. 36: NW ¼ NE. ¼, 08637 (Sundance), July 22, 1912	40.00
S. ½ NE. ¼, S. ½ NW. ¼, S. ½ SW. ¼, 08636 (Sundance), July 22, 1912	240.00
NE. ¼ NE. ¼, 07137 (Lander), June 5, 1915	40.00
N. ½ NW. ¼, NE. ¼ SW. ¼, 010810 (Sundance), June 6, 1915	120.00
NW. ¼ SW. ¼, 011513 (Sundance), January 8, 1916	40.00
In T. 47 N., R. 116 W.:	
Sec. 16: SW. ¼, 013280 (Cheyenne), April 30, 1915	160.00
In T. 45 N., R. 111 W.:	
Sec. 16: S. ½ SW. ¼, NW. ¼ SW. ¼, 05281 (Evanston), January 6, 1916	120.00
NE. ¼ SW. ¼, 011521 (Sundance), January 8, 1916	40.00
In T. 46 N., R. 109 W.:	
Sec. 16: NE. ¼ SW. ¼, 07124 (Lander), May 25, 1915	40.00
SE. ¼, 0866 (Sundance), May 14, 1906	160.00
In T. 48 N., R. 118 W.:	
Sec. 36: NW. ¼ SW. ¼, S. ½ SW. ¼, SW. ¼ SE. ¼, 05037 (Lander) April 27, 1911, base for pending I. S. S.	160.00
NE. ¼ SW. ¼, 013395 (Cheyenne), May 22, 1915, base for pending I. S. S.	40.00
Total number of acres pending I. S. S.	1,638.75

SUMMARY.

Present area of park, 3,348 square miles	2,142,720
Proposed addition, 1,265 square miles	809,600
Total, 4,613 square miles	2,952,320

STATUS OF LANDS.[1]

Patented entries	1,889.18
Pending entries	2,704.44
Lands offered as base for pending indemnity school selections	1,638.75
Total alienations	6,232.37

[1] Status of lands involved in the proposed extension of Yellowstone National Park have been corrected to June 1, 1919, and show 2,521.72 acres patented, 2,051.90 acres pending and 598.75 acres in pending indemnity school selections. Total alienations, 5,172.37 acres.

[House Report No. 1116, Sixty-fifth Congress, third session.]

HAWAII NATIONAL PARK.

February 21, 1919.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. Houston, from the Committee on the Territories, submitted the following report (to accompany H. R. 13699).

The Committee on the Territories, having under consideration H. R. 13699, a bill to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park, recommend that the same be amended by inserting in section 1, line 4, after the word "authorized," the words "subject to the approval of the Secretary of the Interior"; and also in same line, after the word "otherwise," strike out the comma and insert the words "except by purchase"; and that the bill as so amended do pass.

We submit herewith letters from the Secretary of the Interior to Delegate Kalanianaole and to the chairman of this committee, as follows:

DEPARTMENT OF THE INTERIOR,
Washington, January 3, 1919.

MY DEAR MR. KALANIANAOLE: When I was in Hawaii last summer I had some conferences with the trustees of the Bishop estate, who control most of the privately owned land in the Kalauea section of the Hawaii National Park, for the purpose of effecting some arrangement with these gentlemen whereby all or the major portion of this private property might be acquired by the Federal Government for park purposes.

You will recall that the organic act establishing the Hawaii National Park, the act of August 1, 1916 (39 Stat., 432), contains the following provisos in section 4:

"Provided, That no appropriation for the maintenance, supervision, and improvement of said park in excess of $10,000 annually shall be made unless the same shall have first been expressly authorized by law: *And provided further,* That no appropriation shall be made for the improvement or maintenance of said park until proper conveyance shall be made to the United States of such perpetual easements and rights of way over private lands within the exterior boundaries of said park as the Secretary of the Interior shall find necessary to make said park reasonably accessible in all its parts, and said Secretary shall when such easements and rights of way have been conveyed to the United States report the same to Congress."

Until the requirements of the last proviso are met, it is clear that we can make no progress in the development of the park as a tourist resort, or even give it adequate protection from depredations upon its natural features. These obstacles I wish to remove as soon as possible.

My conferences with the representatives of the Bishop estate resulted in an offer by these trustees to convey the larger part of their holdings, including the portion of the Kilauea Crater owned by the estate, to the Territory of Hawaii, for later dedication by Executive order as park land, in exchange for land belonging to the Territory outside of the park areas. An exchange of this character would be mutually advantageous to the Territory and to the owners of the private lands in the park. Resort to the laws governing the Territory fails to reveal authority for consummating a transaction of this character, and it is necessary to secure additional legislation authorizing the governor of the Territory to proceed with the pending exchange.

I am transmitting herewith a form of bill which will relieve the existing situation and I would be grateful if you would introduce the measure and have it referred to this department by the Committee on the Territories in order that a report may be submitted on the bill at an early date.

I am writing a similar letter to Senator Pittman.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

Hon. J. KUHIO KALANIANAOLE,
House of Representatives.

THE SECRETARY OF THE INTERIOR,
Washington, January 20, 1919.

MY DEAR MR. HOUSTON: I have your letter of January 15, requesting a report on H. R. 13699, "A bill to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park."

The department is much interested in this bill, as the organic act establishing the Hawaii National Park contains the proviso in section 4 that no appropriation shall be made for the improvement or maintenance of the park until proper conveyance has been made to the United States of such perpetual easements and rights of way over private lands within the exterior boundaries of the park as are necessary to make the reservation accessible in all its parts. Until the requirements of this proviso are met, no progress can be made in the development of the park as a tourist resort, nor can it even be protected.

I have no criticism to make on the form and substance of the bill, and I recommend that it be taken up for early consideration with a view to its passage in the near future.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

Hon. W. C. HOUSTON,
Chairman Committee on the Territories,
House of Representatives.

From the representation made in these letters it is manifest that authority should be given for the exchange of lands owned by the Territory for the lands lying within the boundaries of the Hawaii National Park or that the governor be authorized to accept for the Territory gifts of land lying within the boundaries of the park, in order that complete ownership of the area within the boundaries of the park should be obtained and that all necessary easements and rights of way may be obtained. Under the terms of this bill no outlay of money will be made by the Government or the Territory for securing the title to the lands within the boundaries of the park.

[Senate Report No. 757, Sixty-fifth Congress, third session.]

HAWAII NATIONAL PARK.

February 25, 1919.—Ordered to be printed.

Mr. Saulsbury, from the Committee on Pacific Islands and Porto Rico, submitted the following report (to accompany S. 5323).

The Committee on Pacific Islands and Porto Rico, to whom was referred the bill (S. 5323) to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park, having considered the same, report thereon with a recommendation that the bill do pass.

A letter from the Secretary of the Interior, under date of February 12, 1919, is appended hereto and made a part of this report.

DEPARTMENT OF THE INTERIOR,
Washington, February 12, 1919.

MY DEAR SENATOR: In acknowledging your letter of January 30, requesting report on S. 5323, "A bill to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park," permit me to state that I am heartily in favor of this proposed legislation and I trust that it will be passed at an early date.

The act of August 1, 1916, establishing the park provides that no appropriation shall be made for its maintenance or improvement until proper conveyances shall be made to the United States of such perpetual easements and rights of way over private lands within the exterior boundaries of said park as the secretary of the Interior shall find necessary to make it reasonably accessible in all its parts. Until the requirements of this proviso are met no progress can be made in the development of the park, nor can even protection be accorded it.

The bill under consideration is designed to enable the Department of the Interior to secure these private holdings so that active administration of the park lands may be assumed, and my own visit to Hawaii last summer convinced me of the importance of this.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

Hon. WILLARD SAULSBURY,
Chairman Committee on Pacific Islands and Porto Rico,
United States Senate.

[House Report No. 139, Sixty-sixth Congress, first session.]

HAWAII NATIONAL PARK.

July 21, 1919.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. Dowell, from the Committee on the Territories, submitted the following report (to accompany H. R. 3654).

The Committee on the Territories, having under consideration H. R. 3654, a bill to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park, after consideration, recommend that the bill do pass.

This bill is the same as S. 5323 of the Sixty-fifth Congress, which was passed by the Senate on February 25, 1919. It is also substantially the same

as H. R. 13699, which was recommended by the Committee on the Territories at the last Congress, and the purpose of the bill is to authorize the governor of Hawaii to acquire approximately 14,000 acres of land and rights of way within the boundaries of the Hawaii National Park, now owned by the Bishop estate, in exchange for land of like value belonging to the Territory of Hawaii.

The evidence before the committee estimates the value of the land to be acquired at about $50,000.

We submit herewith letters from the Secretary of the Interior to the Delegate from Hawaii, Hon. J. Kuhio Kalanianaole, and to Hon. W. C. Houston, chairman of the Committee on the Territories at the last session of Congress, and also to the honorable Chairman of the Committee on the Territories, Hon. Charles F. Curry, as follows:

DEPARTMENT OF THE INTERIOR.
Washington, January 3, 1919.

MY DEAR MR. KALANIANAOLE: When I was in Hawaii last summer I had some conferences with the trustees of the Bishop estate, who control most of the privately owned land in the Kilauea section of the Hawaii National Park, for the purpose of effecting some arrangement with these gentlemen whereby all or the major portion of this private property might be acquired by the Federal Government for park purposes.

You will recall that the organic act establishing the Hawaii National Park, the act of August 1, 1916 (39 Stat., 432), contains the following provisos in section 4:

"*Provided*, That no appropriation for the maintenance, supervision, and improvement of said park in excess of $10,000 annually shall be made unless the same shall have first been expressly authorized by law: *And provided further*, That no appropriation shall be made for the improvement or maintenance of said park until proper conveyance shall be made to the United States of such perpetual easements and rights of way over private lands within the exterior boundaries of said park as the Secretary of the Interior shall find necessary to make said park reasonably accessible in all its parts, and said Secretary shall, when such easements and rights of way have been conveyed to the United States, report the same to Congress."

Until the requirements of the last proviso are met, it is clear that we can make no progress in the development of the park as a tourist resort, or even give it adequate protection from depredations upon its natural features. These obstacles I wish to remove as soon as possible.

My conferences with the representatives of the Bishop estate resulted in an offer by these trustees to convey the larger part of their holdings, including the portion of the Kilauea Crater owned by the estate, to the Territory of Hawaii, for later dedication by Executive order as park land, in exchange for land belonging to the Territory outside of the park areas. An exchange of this character would be mutually advantageous to the Territory and to the owners of the private lands in the park. Resort to the laws governing the Territory fails to reveal authority for consummating a transaction of this character, and it is necessary to secure additional legislation authorizing the governor of the Territory to proceed with the pending exchange.

I am transmitting herewith a form of bill which will relieve the existing situation, and I would be grateful if you would introduce the measure and have it referred to this department by the Committee on Territories in order that a report may be submitted on the bill at an early date.

I am writing a similar letter to Senator Pittman.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

HON. J. KUHIO KALANIANAOLE,
House of Representatives.

DEPARTMENT OF THE INTERIOR.
Washington, January 20, 1919.

MY DEAR MR. HOUSTON: I have your letter of January 15, requesting a report on H. R. 13699, "A bill to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park."

The department is much interested in this bill, as the organic act establishing the Hawaii National Park contains the proviso in section 4 that no appropriation shall be made for the improvement or maintenance of the park until proper conveyance has been made to the United States of such perpetual easements and rights of way over private lands within the exterior boundaries of the park as are necessary to make the reservation accessible in all its parts. Until the requirements of this proviso are met no progress can be made in the development of the park as a tourist resort, nor can it even be protected.

I have no criticism to make on the form and substance of the bill, and I recommend that it be taken up for early consideration with a view to its passage in the near future.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

HON. W. C. HOUSTON,
Chairman Committee on the Territories,
House of Representatives.

From the representation made in these letters it is manifest that authority should be given for the exchange of lands owned by the Territory for the lands lying within the boundaries of the Hawaii National Park or that the governor be authorized to accept for the Territory gifts of land lying within the boundaries of the park, in order that complete ownership of the area within the boundaries of the park should be obtained and that all necessary easements and rights of way may be obtained.

Under the terms of this bill no outlay of money will be made by the Government or the Territory for securing the title to the lands within the boundaries of the park.

DEPARTMENT OF THE INTERIOR,
Washington, July 1, 1919.

MY DEAR MR. CURRY: I have your request of June 14, for a report on H. R. 3654, "A bill to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park." This bill is identical with S. 5323 of the Sixty-fifth Congress, as that measure was passed by the Senate on February 25, 1919. It is also identical with H. R. 13699 of the last Congress. I am heartily in favor of this proposed legislation, and I trust that it will be passed at an early date.

The act of August 1, 1916, establishing the park, provides that no appropriation shall be made for its maintenance or improvement until proper conveyances shall be made to the United States of such perpetual easements and rights of way over private lands within the exterior boundaries of said park as the Secretary of the Interior shall find necessary to make it reasonably accessible in all its parts. Until the requirements of this proviso are met no progress can be made in the development of the park, nor can even protection be accorded it.

The bill under consideration is designed to enable the Department of the Interior to secure these private holdings so that active administration of the park lands may be assumed, and my own visit to Hawaii last summer convinced me of the importance of this.

The Hawaii National Park as presently constituted includes three noncontiguous tracts of land, two of which are on the island of Hawaii and include the craters of the volcano Kilauea and the crater Mokuaweoweo on the summit of Mauna Loa; the third tract is on the island of Maui, and embraces the great extinct crater Haleakala.

The organic act establishing the park provides for the acceptance by the Federal Government of a tract of land connecting the Kilauea and Mauna Loa sections of the park. This tract, which is to be used as a right of way for an automobile road is to be selected after a survey of the road has been made.

In the Kilauea section of the park there are approximately 20,000 acres of privately owned lands, most of which belong to the P. B. Bishop estate, and a large part of the Haleakala section is private property. At the time that the park was created there were approximately 7,000 acres of privately owned land in the Mauna Loa section, but recently these lands have been donated to the Federal Government.

In the Kilauea and Haleakala sections it will not be necessary to acquire all of the private holdings, but in order to carry out the purposes of Congress in establishing the park it is absolutely essential that some large tracts of forest lands be acquired and also a number of important rights of way for roads and trails.

The owners of the private lands that the Government seeks to acquire are willing to exchange their property for territorial lands on the basis provided for by pending legislation, and it is from every standpoint fair and reasonable.

FRANKLIN K. LANE, *Secretary.*

Hon. C. F. CURRY,
House of Representatives, United States.

We also submit a statement of Hon. J. K. Kalanianaole, Delegate in Congress from Hawaii, in support of this bill as follows:

I favor the passage of bill H. R. 3654 and ask early attention to same.

The people of Hawaii are very anxious that some means be provided to acquire the privately owned lands within the park boundaries as set out in the law creating the Hawaii National Park, so that the provisions of the law may be complied with and the Director of National Parks be given appropriations by Congress sufficient to make the areas in question a park in deed as well as in name and open up our wonderful natural scenery and our ever active volcano to the people of the United States and include the Hawaii park in the list of parks open to the people of the whole United States in such a manner that they need never feel that they are trespassing upon private rights or property.

I urge, gentlemen, that the bill be reported favorably and be placed on the calendar, looking to an early enactment, assuring you that it has the backing of the people of the Territory of Hawaii.

From the above correspondence it is clear the Secretary of the Interior not only highly recommends the passage of this bill as fair and reasonable but deems it necessary in order to develop and properly protect the National Park of Hawaii.

[Senate Report No. 22, Sixty-sixth Congress, first session.]

ZION NATIONAL PARK, UTAH.

June 20, 1919.—Ordered to be printed.

Mr. Smoot, from the Committee on Public Lands, submitted the following report (to accompany S. 425).

The Committee on Public Lands, to whom was referred the bill (S. 425) to establish the Zion National Park in the State of Utah, having had the same under consideration, report thereon without amendment and with the recommendation that the bill do pass.

The bill was referred to the Department of the Interior, and the Secretary of that department furnished the committee with the following report thereon:

DEPARTMENT OF THE INTERIOR,
Washington, June 12, 1919.

MY DEAR SENATOR: I have your request of June 5 for report on S. 425, a bill to establish the Zion National Park in the State of Utah. As this bill is identical with S. 5039 of the Sixty-fifth Congress, I am inclosing a copy of my favorable report on that measure for the use of the committee. I have no additional information or suggestions to add to that report. I regard this park project as being in every respect worthy of early favorable consideration of Congress.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

Hon. REED SMOOT,
United States Senate.

DEPARTMENT OF THE INTERIOR,
Washington, December 27, 1918.

MY DEAR SENATOR: I have your request of November 22 for a report on S. 5039, "A bill to establish the Zion National Park in the State of Utah." This measure provides that Zion National Monument, reserved under the act of June 8, 1906 (34 Stat., 225), by proclamation of the President dated July 31, 1909 (36 Stat., 2498), and March 18, 1918 (40 Stat., proc. 1435), shall be elevated to the status of a national park. Copies of the proclamation establishing the monument are attached hereto.

This reservation, which is located in Washington County, southwestern Utah, was named Mukuntuweap National Monument by the proclamation of July 31, 1909, but the later instrument, which enlarged the monument from 15,840 acres to 76,800 acres, changed the name to Zion. The name Mukuntuweap was an Indian expression of doubtful meaning and had no particular association with the area reserved. The name Zion, however, is peculiarly appropriate. The Mormon pioneers who settled in the Virgin River region more than 60 years ago called the gorge of the north fork of this river Little Zion Canyon, because they regarded this place as a refuge to which they might repair in case of hostile Indian raids.

Zion Canyon is an extraordinary gorge cut from brilliantly colored sedimentary rocks by the North Fork of the Virgin River. Its proportions are about equal to those of Yosemite Valley in Yosemite National Park; the walls are several hundred feet lower and the canyon is considerably narrower. In the cutting of the gorge, however, the torrential stream, and wind and rain, have carved domes, spires, towers, and other curious forms that strikingly resemble many of the features of Yosemite Valley. More interesting than the carving of Zion's cliffs is their exquisite coloring. Red predominates, as it does in the Grand Canyon in Arizona, but there are amazing combinations of brown, black, and white colors with the red and with each other. White sandstone is superimposed on the red strata, and other layers of the red rock lie in turn upon the white. The action of water upon the exposed surfaces of these rocks has produced a symphony of color that gives the canyon its greatest charm. The finishing touches are given by the forests of the valley floor and the trees on the rim and in the niches of the nearly perpendicular canyon walls. Early scientific explorers of the Southwest, including Maj. J. W. Powell, who made the first trip through the Grand Canyon of the Colorado River, visited Zion Canyon and wrote of the great beauty of the gorge and the brilliance of its coloring, and several artists, including Thomas Moran, have conveyed the wonders of the region to the world by paintings of distinction.

For many years, however, southwestern Utah was inaccessible to the tourist. Poor roads and tremendous distances discouraged travel, even by the pathfinding motorist. Then came the great development of the resources of this section of the State, following the completion of the Salt Lake route. This included extensive road improvement. Recently the State highway system was extended to include all of the roads between Salt Lake City and Zion Canyon, and the branch highways to Lund and other points on the Salt Lake route.

Thus made accessible by automobile and by train and motor, visitors sought Zion Canyon and the north rim of the Grand Canyon. In 1917 it became necessary to establish a regular transportation line from the railroad at Lund and a permanent camp enterprise in the gorge itself. Facilities for the accommodation of the public are now as good as they are in many of the large national parks. There are few roads and trails in the national monument, however, and many improvements will be required therein within the next few years. In the deficiency appropriation act approved September 8, 1916 (39 Stat., 818), $15,000 was appropriated for improving the road in the monument from the end of the State highway, but very little money for maintenance has been available since this work was completed.

I have dwelt particularly upon Zion Canyon because it is now so readily accessible and because it is actually being used as a tourist resort, but there are other canyons in the reservation that are bigger and even more beautifully colored. Still more remain to be entered and explored. In time they will all be open to the public. Furthermore, there are in the reservation mountains, waterfalls, natural bridges, ancient cliff dwellings, and numerous other features interesting to the tourist and exceedingly valuable to the scientist and student. The entire area should be protected for all time as a national park, and I recommend that the bill under consideration receive the approval of your committee and of Congress. I have no criticism to make of the form and substance of this bill.

Practically all of the land affected by the pending legislation is unappropriated public land. The alienated lands within the boundaries of the proposed park are properly classified in the lists attached hereto.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

Hon. HENRY L. MYERS,
Chairman Committee on Public Lands, United States Senate.

[House Report No. 262, Sixty-sixth Congress, first session.]

Zion National Park Utah.

August 26, 1919.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. Mays, from the Committee on the Public Lands, submitted the following report (to accompany S. 425):

The Committee on the Public Lands, to whom was referred the bill (S. 425) to establish the Zion National Park in the State of Utah, having had the same under consideration, report thereon without amendment and with the recommendation that the bill do pass.

Within the past year the State of Utah has completed an excellent motor road from Salt Lake City to Zion Canyon, a distance of somewhat over 300 miles. The Government has built a good road through the canyon. The Salt Lake Route Railway has a station at Lund, whence motor stages carry visitors to the canyons, so that transportation difficulties have now been completely removed. Within the reservation, on the valley's floor, there is a permanent camp, which provides comfortable accommodation for visitors.

The Arrowhead Trail, an automobile road from Los Angeles to Salt Lake City, passes within 20 miles of the entrance to the proposed park. The Government has just constructed a bridge over the Virgin River within the proposed park and constructed an automobile road within the reserve. The State has made a good road from the Arrowhead Trail to the entrance. W. W. Wylie, so well known as the founder of the "Wylie Way" in the Yellowstone Park, and who for 26 years conducted the Wylie camps there, has obtained from the Department of the Interior a franchise to maintain and operate permanent camps in the proposed Zion National Park.

From an archæological point of view it is highly important that the Government should preserve this important source of scientific research. Along the perpendicular sides of these great gorges are the homes of the prehistoric cliff dwellers of this land. It will be agreed that the preservation of these ruins from the despoiling hands of commercial interests ought to be undertaken by the Government itself.

The bill was referred to the Department of the Interior, and the Secretary furnished the Senate committee with the following report thereon:

Department of the Interior,
Washington, June 12, 1919.

My Dear Senator: I have your request of June 5 for report on S. 425, a bill to establish the Zion National Park in the State of Utah. As this bill is identical with S. 5039 of the Sixty-fifth Congress, I am inclosing a copy of my favorable report on that measure for the use of the committee. I have no additional information or suggestions to add to that report. I regard this park project as being in every respect worthy of early favorable consideration of Congress.

Cordially, yours,

Franklin K. Lane, *Secretary.*

Hon. Reed Smoot,
United States Senate.

Department of the Interior,
Washington, December 27, 1918.

My Dear Senator: I have your request of November 22 for a report on S. 5039, "A bill to establish the Zion National Park in the State of Utah." This measure provides that Zion National Monument, reserved under the act of June 8, 1906 (34 Stat., 225), by proclamation of the President dated July 31, 1909 (36 Stat., 2498), and March 18, 1918 (40 Stat., proc. 1435), shall be elevated to the status of a national park. Copies of the proclamation establishing the monument are attached hereto.

This reservation, which is located in Washington County, southwestern Utah, was named Mukuntuweap National Monument by the proclamation of July 31, 1909, but the later instrument, which enlarged the monument from 15,840 acres to 76,800 acres, changed the name to Zion. The name Mukuntuweap was an Indian expression of doubtful meaning and had no particular association with the area reserved. The name Zion, however, is peculiarly appropriate. The Mormon pioneers who settled in the Virgin River region more than 60 years ago called the gorge of the north fork of this river Little Zion Canyon, because they regarded this place as a refuge to which they might repair in case of hostile Indian raids.

Zion Canyon is an extraordinary gorge cut from brilliantly colored sedimentary rocks by the North Fork of the Virgin River. Its proportions are about equal to those of Yosemite Valley in Yosemite National Park; the walls are several hundred feet lower and the canyon is considerably narrower. In the cutting of the gorge, however, the torrential stream and wind and rain have carved domes, spires, towers, and other curious forms that strikingly resemble many of the features of Yosemite Valley. More interesting than the carving of Zion's cliffs is their exquisite coloring. Red predominates, as it does in the Grand Canyon in Arizona, but there are amazing combinations of brown, black, and white colors with the red and with each other. White sandstone is superimposed on the

red strata, and other layers of the red rock lie in turn upon the white. The action of water upon the exposed surfaces of these rocks has produced a symphony of color that gives the canyon its greatest charm. The finishing touches are given by the forests of the valley floor and the trees on the rim and in the niches of the nearly perpendicular canyon walls. Early scientific explorers of the Southwest, including Maj. J. W. Powell, who made the first trip through the Grand Canyon of the Colorado River, visited Zion Canyon and wrote of the great beauty of the gorge and the brilliance of its coloring, and several artists, including Thomas Moran, have conveyed the wonders of the region to the world by paintings of distinction.

For many years, however, southwestern Utah was inaccessible to the tourist. Poor roads and tremendous distances discouraged travel, even by the pathfinding motorist. Then came the great development of the resources of this section of the State, following the completion of the Salt Lake route. This included extensive road improvement. Recently the State highway system was extended to include all of the roads between Salt Lake City and Zion Canyon and the branch highway to Lund and other points on the Salt Lake route.

Thus made accessible by automobile and by train and motor, visitors sought Zion Canyon and the north rim of the Grand Canyon. In 1917 it became necessary to establish a regular transportation line from the railroad at Lund and a permanent camp enterprise in the gorge itself. Facilities for the accommodation of the public are now as good as they are in many of the large national parks. There are few roads and trails in the national monument, however, and many improvements will be required therein within the next few years. In the deficiency appropriation act approved September 8, 1916 (39 Stat., 818), $15,000 was appropriated for improving the road in the monument from the end of the State highway, but very little money for maintenance has been available since this work was completed.

I have dwelt particularly upon Zion Canyon because it is now so readily accessible and because it is actually being used as a tourist resort, but there are other canyons in the reservation that are bigger and even more beautifully colored. Still more remain to be entered and explored. In time they will all be open to the public. Furthermore, there are in the reservation mountains, waterfalls, natural bridges, ancient cliff dwellings, and numerous other features interesting to the tourist and exceedingly valuable to the scientist and student. The entire area should be protected for all time as a national park, and I recommend that the bill under consideration receive the approval of your committee and of Congress. I have no criticism to make of the form and substance of this bill.

Practically all of the land affected by the pending legislation is unappropriated public land. The alienated lands within the boundaries of the proposed park are properly classified in the lists attached hereto.

Cordially, yours,

FRANKLIN K. LANE, *Secretary.*

HON. HENRY L. MYERS,
Chairman Committee on Public Lands, United States Senate.

APPENDIX E.

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Bibliography of books and magazine articles on national park subjects. October 1, 1918, to September 30, 1919.

Bibliography of books, Government reports, and magazine articles on Grand Canyon National Park.

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APPENDIX F.

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NATIONAL PARK PUBLICATIONS.

[Mailed free of charge upon application to the Director of the National Park Service, Washington, D. C.]

Annual Report of the National Park Service for the year 1919. Stephen T. Mather, director.

Contains summary of the operation and development of the national parks for current year, photographs of more important improvements, reports of park superintendents, national park and monument statistics, etc.

Annual Report of the National Park Service for the year 1918. Stephen T. Mather, director. (Edition exhausted.)

Annual Report of the National Park Service for the year 1917. Horace M. Albright, acting director. (Edition exhausted.)

Progress in the Development of the National Parks. By Stephen T. Mather, Director of the National Park Service, 1916. 39 pages.

Report on the Proposed Sand Dunes National Park, Indiana. By Stephen T. Mather, Director of the National Park Service. 1917. 113 pages.

Contains description and maps of the sand dunes, the history of the project, and the hearings held in Chicago October 30, 1916.

Early History of Glacier National Park, Montana. By Madison Grant. 1919. 12 pages.

Glimpses of our National Parks. By Robert Sterling Yard. 48 pages.

Contains descriptions of the most important features of the principal national parks.

Information circulars containing data regarding hotels, camps, points of interest, bibliography, maps, regulations, etc., about each of the following national parks:

Yellowstone.	Mesa Verde.	Glacier.
Yosemite.	Sequoia and	Rocky Mountain.
Mount Rainier.	General Grant.	Wind Cave.
Crater Lake.	Hot Springs Reservation.	Grand Canyon (in course of preparation).

Information circulars relating to national monuments:

General information regarding Casa Grande National Monument, Arizona.

General information regarding the National Monuments. (Edition exhausted.)

Contains brief descriptions of the national monuments, administered by the Department of the Interior, the Department of Agriculture, and the War Department (excepting Casa Grande, Verendrye, and Katmai National Monuments).

Map showing all national parks and national monuments, administered by the National Park Service, with railroad connections.

Automobile road and trail map of each of the following national parks:

Yellowstone.	Sequoia and	Glacier.
Yosemite.	General Grant.	Rocky Mountain.
Mount Rainier.	Crater Lake.	Grand Canyon (in course of preparation).

The folowing-named publications relating to Lafayette National Park (formerly Sieur de Monts National Monument):

Announcement by the Government of the creation of the Sieur de Monts National Monument by Presidential Proclamation on July 8, 1916.

Addresses at meeting held at Bar Harbor on August 22, 1916, to commemorate the establishment of the Sieur de Monts National Monument.

The Sieur de Monts National Monument as a Bird Sanctuary.

The Coastal Setting, Rocks and Woods of the Sieur de Monts National Monument.

An Acadian Plant Sanctuary.

Wild Life and Nature Conservation in the Eastern States.

Man and Nature. Our Duty to the Future.

The Acadian Forest.

The Sieur de Monts National Monument as commemorating Acadia and early French influences of Race and Settlement in the United States.

Purchas translation of de Monts' Commission. De Monts: an Appreciation.

Natural Bird Gardens on Mount Desert Island.

The Sieur de Monts National Monument and its Historical Associations.

Garden Approaches to the National Monument. The White Mountain National Forest. Crawford Notch in 1797.

Two National Monuments—The Desert and the Ocean Front. (Mount Desert, Maine; and Zion Canyon, Utah.)

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PAMPHLETS.

General.

National Parks Portfolio. By Robert Sterling Yard. 1917. 260 pages, including 270 illustrations. Pamphlet edition, loose in flexible cover, 35 cents; book edition, containing same material securely bound in cloth, 55 cents.

Contains nine sections, each descriptive of a national park and one larger section devoted to other national parks and monuments.

Proceedings of the [First] National Park Conference Held at Yellowstone National Park, September 11 and 12, 1911. 210 pages. 15 cents.

Contains a discussion of national-park problems by officers of the Government and other persons.

Proceedings of the [Second] National Park Conference Held at Yosemite National Park, October 14, 15, and 16, 1912. 146 pages. 15 cents.

Consists mainly of a discussion regarding the advisability of admitting automobiles to the national parks.

Proceedings of the [Third] National Park Conference Held at Berkeley, Calif., March 11, 12, and 13, 1915. 1915. 166 pages. 20 cents.

Contains discussions of national-park problems by officers of the Government and others.

Proceedings of the [Fourth] National Park Conference Held at Washington, D. C., January 2 to 6, 1917. 362 pages. 25 cents.

Contains discussions of national-park problems by officers of the Government and others.

Crater Lake National Park.

Geological History of Crater Lake. By J. S. Diller. 1912. 32 pages, including 28 illustrations. 10 cents.

Contains an account of the formation of Crater Lake.

Forests of Crater Lake National Park. By J. F. Pernot. 1916. 40 pages, including 26 illustrations. 20 cents.

Contains descriptions of the forest cover and of the principal species.

Glacier National Park.

Origin of the Scenic Features of Glacier National Park. By M. R. Campbell. 1914. 42 pages, including 25 illustrations. 15 cents.

Contains a general account of the forces that have caused the development of the mountain ranges, the valleys, and lakes of Glacier National Park.

Glaciers of Glacier National Park. By W. C. Alden. 1914. 48 pages, including 30 illustration. 15 cents.

Contains descriptions of the principal features of the larger glaciers in the park.

Some Lakes of Glacier National Park. By M. J. Elrod. 1912. 32 pages, including 19 illustrations. 10 cents.

Contains a description of some of the principal lakes, with special reference to the possibility of stocking the lakes with fish.

Glacier National Park—A Popular Guide to Its Geology and Scenery. By M. R. Campbell. (Bulletin 600, U. S. Geological Survey.) 1914. 54 pages, 13 plates, including map. 30 cents.

Wild Animals of Glacier National Park; The Mammals, by Vernon Bailey; The Birds, by Florence Merriam Bailey; 1919. 240 pages, 94 text figures, 37 plates, including map. 50 cents.

Describes the birds and animals both popularly and scientifically; tells how the visitor may identify them.

Hot Springs Reservation.

Analyses of the Waters of the Hot Springs of Arkansas, by J. K. Haywood, and Geological Sketch of Hot Springs, Ark., by Walter Harvey Webb. 56 pages. 10 cents.

Lassen Volcanic National Park.

The Volcanic History of Lassen Peak. By J. S. Diller. 5 cents.

Contains a detailed account of the geologic and scenic features of Lassen Volcanic National Park.

Mesa Verde National Park.

Antiquities of the Mesa Verde National Park: Spruce Tree House.[1] By J. W. Fewkes. (Bull. 41, Bureau of American Ethnology.) 1909. 58 pages, 21 plates, 37 text figures. 40 cents.

Contains a detailed account of the structure and of the objects found in it.

Antiquities of Mesa Verde National Park: Cliff Palace.[1] By J. W. Fewkes. (Bull. 51, Bureau of American Ethnology.) 1911. 82 pages, 35 plates, 4 text figures. 45 cents.

Contains a detailed account of the structure and of the objects found in it.

Excavation and Repair of Sun Temple. By J. W. Fewkes. 1916. 32 pages, including 18 illustrations. 15 cents.

Contains an account of a new ruin discovered in 1915.

Mount Rainier National Park.

Features of the Flora of Mount Rainier National Park. By J. B. Flett. 1916. 48 pages, including 40 illustrations. 25 cents.

Contains descriptions of the flowering trees, shrubs, and plants in the park.

Forests of Mount Rainier National Park. By G. F. Allen. 1916. 32 pages, including 27 illustrations. 20 cents.

Contains descriptions of the forest cover and of the principal species.

Mount Rainier and Its Glaciers. By F. E. Matthes. 1914. 48 pages, including 26 illustrations. 15 cents.

Contains a general account of the glaciers of Mount Rainier and of the development of the valleys and basins surrounding the peak.

Rocky Mountain National Park.

Geologic Story of Rocky Mountain National Park. By Willis T. Lee, Ph. D. 1917. 89 pages, 45 plates, 6 text figures. 30 cents.

Contains a detailed description of the park and its various geologic and scenic features.

Mountaineering in the Rocky Mountain National Park. By Roger W. Toll. 1919. 48 illustrations and 2 maps. 25 cents.

Contains directions for climbing principal mountains of the Rocky Mountain Park region. For beginners as well as experienced mountaineers.

Sequoia and General Grant National Parks.

See Yosemite.

Yellowstone National Park.

Geological History of Yellowstone National Park. By Arnold Hague. 1912. 24 pages, including 10 illustrations. 10 cents.

Contains a general résumé of the geologic forces that have been active in the Yellowstone National Park.

Geysers. By Walter Harvey Weed. 1912. 32 pages, including 23 illustrations. 10 cents.

In this pamphlet is a description of the forces which have produced the geysers.

[1] Out of print.

Fossil Forests of Yellowstone National Park. By F. H. Knowlton. 1914. 32 pages, including 15 illustrations. 10 cents.

Contains descriptions of the fossil forests of the Yellowstone National Park and an account of their origin.

Fishes of the Yellowstone National Park. By W. C. Kendall. (Bureau of Fisheries Document 818.) 1915. 28 pages, including 17 illustrations. 5 cents.

Contains descriptions of the species and lists of streams where found.

Yosemite National Park.

Forests of Yosemite, Sequoia, and General Grant National Parks. By C. L. Hill. 1916. 40 pages, including 23 illustrations. 20 cents.

Contains description of the forest cover and of the principal species.

The Secret of the Big Trees—Yosemite, Sequoia, and General Grant National Parks. By Ellsworth Huntington. 1913. 24 pages, including 14 illustrations. 5 cents.

Contains an account of the climatic changes that are indicated by the thickness of the growth rings in the big trees, and gives a comparative statement of the climatic conditions in California and Asia during a period of 3,400 years.

Sketch of Yosemite National Park and An Account of the Origin of Yosemite and Hetch Hetchy Valleys. By F. E. Matthes. 1912. 48 pages, including 24 illustrations. 10 cents.

Contains a description of the general features of the Sierra Nevada and the Yosemite National Park and an account of the origin of the Yosemite and Hetch Hetchy Valleys.

PANORAMIC VIEWS.

(The panoramic views listed below are based on accurate surveys and give an excellent idea of the configuration of the surface as it would appear to a person flying over it. The meadows and valleys are printed in light green, the streams and lakes in light blue, the cliffs and ridges in combinations of color, and the roads in light brown. The lettering is printed in light brown and is easily read on close inspection, but merges into the other colors when the sheet is held at some distance.)

Panoramic view of Crater National Park. 16½ x 18 inches, scale 1 mile to the inch. 25 cents.

Panoramic view of Yosemite National Park. 18½ x 18 inches, scale 3 miles to the inch. 25 cents.

Panoramic view of Glacier National Park. 18½ x 21 inches, scale 3 miles to the inch. 25 cents.

Panoramic view of Mount Rainier National Park. 20 x 19 inches, scale 1 mile to the inch. 25 cents.

Panoramic view of Yellowstone National Park. 18 x 21 inches, scale 3 miles to the inch. 25 cents.

Panoramic view of Mesa Verde National Park. 22½ x 19 inches, scale three-fourths mile to the inch. 25 cents.

Panoramic view of Rocky Mountain National Park. 14 x 17½ inches, scale 2 miles to the inch. 25 cents.

TOPOGRAPHIC MAPS SOLD BY THE U. S. GEOLOGICAL SURVEY.

(The maps listed below may be purchased from the Director of the United States Geological Survey, Washington, D. C. Remittances should be made by money order or in cash. Personal checks can not be accepted. A discount of 40 per cent is allowed on all orders for maps amounting to $3 net or more.)

National Parks.

Crater Lake National Park, Oreg. Limiting parallels, 42° 48′ and 43° 04′. Limiting meridians, 122° and 122° 16′. Size, 19 by 22 inches. Scale, 1 : 62,500, or about 1 mile to 1 inch. Contour interval, 50 feet. An illustrated description of the lake and the manner of its formation is given on the back of the sheet. Price, 10 cents.

General Grant National Park, Cal. Shown on the Tehipite map. Scale, 1 : 125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 10 cents.

Glacier National Park, Mont. Limiting parallels, 48° 14′ 36″ and 49°. Limiting meridians, 113° 10′ and 114° 30′. Size, 31 by 35 inches. Scale, 1 : 125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 25 cents.

Grand Canyon National Park, Ariz. Large portion shown on Shimumo, Bright Angel, and Vishnu maps. Scale, 1:48,000, or about 1¼ inches to 1 mile. Contour interval, 50 feet. The geologic history of the area covered by the Bright Angel map is given on the back of that sheet. Price of each map, 20 cents.

Hot Springs Reservation, Ark. Shown on the map of Hot Springs and vicinity. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 20 feet. Price, 10 cents.

Lafayette National Park. Shown on Bar Harbor and Mount Desert maps. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 20 feet. Price of each map, 10 cents.

Mesa Verde National Park, Colo. Limiting parallels, 37° 09′ 18″ and 37° 21′. Limiting meridians, 108° 15′ and 108° 37′ 30″. Size, 31 by 46 inches. Scale, 1:31,250, or about one-half mile to 1 inch. Contour interval, 25 feet. Price, 20 cents.

Mount Rainier National Park, Wash. Limiting parallels, 46° 43′ 43″ and 47° 00′. Limiting meridians, 121° 30′ and 121° 55′. Size, 22 by 23 inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 100 feet. Price, 10 cents.

Platt National Park, Okla. This park is at the town of Sulphur, Murray County, which is shown on the Stonewall map. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 50 feet. Price, 10 cents.

Rocky Mountain National Park, Colo. Limiting parallels, 40° 00′ and approximately 40° 33′ 15″. Limiting meridians, 105° 30′ and 106° 00′. Size, 17×22 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 10 cents.

Sequoia National Park, Calif. Shown on the Kaweah and Tehipite maps. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price of each map, 10 cents.

Wind Cave National Park, S. Dak. Shown on the Harney Peak and Hermosa maps. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price of each map, 10 cents.

Yellowstone National Park, Wyo.-Mont.-Idaho. Limiting parallels, 44° 08′ 17″ and 45° 01′ 55″. Limiting meridians, 110° and 111° 05′ 53″. Size, 32 by 36 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 25 cents.

Yosemite National Park, Calif. The park limits established by acts of Congress are shown in colors. Limiting parallels, 37° 30′ and 38° 15′ 39″. Limiting meridians, 119° and 120°. Size, 29 by 31 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 25 cents. Also issued folded between covers; price, 40 cents. The Yosemite Valley is shown on a larger scale on the Yosemite Valley map.

Yosemite Valley, Calif. Shown on the Yosemite Valley map. Limiting parallels, 37° 42′ and 37° 47′ 05″. Limiting meridians, 119° 30′ and 119° 43′ 40″. Scale, 1:24,000, or about 2½ inches to 1 mile. Contour interval, 50 feet. Price, 10 cents.

National monuments.

Casa Grande National Monument, Ariz. The northern part of this area is shown on the Sacaton map. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 50 feet. Price, 10 cents.

Devils Tower National Monument, Wyoming. Shown on Devils Tower map. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 50 feet. Price, 10 cents.

Muir Woods National Monument, California. Shown on Tamalpais map. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 25 feet. Price, 10 cents.

Petrified Forest National Monument, Arizona. Shown on Petrified Forest map. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 25 feet. Price, 10 cents.

RAILROAD GUIDEBOOKS.

(Sold by Superintendent of Documents. Remittances for publications listed below should be made to the Superintendent of Documents, Government Printing Office, Washington, D. C., by money order or in cash. Checks and postage stamps can not be accepted.)

In the Geological Survey bulletins listed below are described the geography, geology, history, and natural resources of the regions traversed by the principal transcontinental routes. Every effort has been made to make the volumes interesting as well as accurate. Matter slightly more detailed or technical than that in the body

of the text has been separated as footnotes, and a glossary has been provided for such geologic terms as it was necessary to use. The more important sources of geologic information on the region are listed in the back, and a table showing the principal divisions of geologic time appears on the backs of the title pages.

Guidebook of the Western United States, Part A, the Northern Pacific Route, with a side trip to Yellowstone Park, by M. R. Campbell and others. (Bulletin 611, U. S. Geological Survey.) 1915. 212 pages, 27 route maps, 27 plates, 39 text figures. 50 cents.

This volume deals with the country along the Northern Pacific Railroad from St. Paul to Seattle and along the branch line to Yellowstone Park. It is the purpose of this volume to answer some of the questions which these views from the car windows evoke, to tell what the rocks are and how they got there, to explain the effects of earth movements upon them, to show how that conspicuous element in scenery which we call topography is the result of a long succession of geologic events—in brief, to tell the story of the mountains, valleys, and plains. It does not stop there, however. It connects this record of the prehistoric past with the present march of western progress and development by showing the relation of geologic processes to natural resources of various kinds; it describes the utilization of these resources and tells how man has turned them to account.

Guidebook of the Western United States, Part B, the Overland Route, with a side trip to Yellowstone Park, by W. T. Lee, R. W. Stone, H. S. Gale, and others. (Bulletin 612, U. S. Geological Survey.) 1915. 244 pages, 29 route maps, 50 plates, 20 text figures. 50 cents.

A handbook for the traveler which deals not only with the geology but with the natural resources, history, and development of the country along the Union Pacific System between Omaha and San Francisco. It shows how differences in scenery and climate depend upon past geologic events and dispels the monotony of the great plains by taking the traveler back to times when these regions supported a vegetation very different from their present scanty covering and were inhabited by animals of strange forms and large size. The scenery of the mountains acquires additional interest from the explanation of the earth movements and the resulting rock structures to which fundamentally the mountain forms are due.

Guidebook of the Western United States, Part C, the Sante Fe Route, with a side trip to the Grand Canyon of the Colorado, by N. H. Darton and others. (Bulletin 613, U. S. Geological Survey.) 1915. 194 pages, 25 route maps, 42 plates, 40 text figures. 50 cents.

This guide describes the country along the Atchison, Topeka & Santa Fe Railroad from Kansas City to Los Angeles. Although the description of the rocks and their relations and the scenic features form a large proportion of the matter, nearly every page gives information as to notable historic events, industrial resources, plants, and animals. The story of the Indians, past and present, especially the characteristic Pueblo tribes, is told in some detail. Many of the facts regarding the rocks are here presented for the first time. The book contains numerous views of prominent scenic features and pictures of restoration of some of the very remarkable animals whose bones are found in the clays.

Guidebook of the Western United States, Part D, the Shasta Route and Coast Line, by J. S. Diller and others. (Bulletin 614, U. S. Geological Survey.) 1915. 142 pages, 19 route maps, 33 plates, 15 text figures. 50 cents.

A manual for the traveler between Seattle or Los Angeles and San Francisco, which describes in clear, simple language the geography, geology, history, and natural resources of the region visible from the car windows. Geology is made interesting to the reader by an avoidance of details and by the selection for treatment of the features that are likely to attract the eye. Care is taken also to point out the connection between the story of the earth and the present human activity in the region. The book is divided into two parts, one dealing with the route from Seattle to San Francisco and one with the route from Los Angeles to San Francisco.

UNITED STATES RAILROAD ADMINISTRATION BOOKLETS.

(The following booklets issued by the United States Railroad Administration can be obtained free of charge upon application to the manager, Bureau of Service, National Parks and Monuments, 646 Transportation Building, Chicago, Ill.)

Crater Lake National Park (Oregon).
Glacier National Park (Montana).
Grand Canyon National Park (Arizona).
Hawaii National Park (Hawaiian Islands).
Hot Springs National Park (Arkansas).
Mesa Verde National Park (Colorado).
Mount Rainier National Park (Washington).
Petrified Forest National Monument (Arizona).
Rocky Mountain National Park (Colorado).
Sequoia and General Grant National Parks (California).
Yellowstone National Park (Wyoming).
Yosemite National Park (California).
Zion National Monument (Utah).

APPENDIX G.

MISCELLANEOUS.

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AN ACT TO ESTABLISH A NATIONAL PARK SERVICE, AND FOR OTHER PURPOSES.

(39 Stat., 535.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby created in the Department of the Interior a service to be called the National Park Service, which shall be under the charge of a director, who shall be appointed by the Secretary and who shall receive a salary of $4,500 per annum. There shall also be appointed by the Secretary the following assistants and other employees at the salaries designated: One assistant director, at $2,500 per annum; one chief clerk, at $2,000 per annum; one draftsman, at $1,800 per annum; one messenger, at $600 per annum; and, in addition thereto, such other employees as the Secretary of the Interior shall deem necessary: *Provided*, That not more than $8,100 annually shall be expended for salaries of experts, assistants, and employees within the District of Columbia not herein specifically enumerated unless previously authorized by law. The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

SEC. 2. That the director shall, under the direction of the Secretary of the Interior, have the supervision, management, and control of the several national parks and national monuments which are now under the jurisdiction of the Department of the Interior, and of the Hot Springs Reservation in the State of Arkansas, and of such other national parks and reservations of like character as may be hereafter created by Congress: *Provided*, That in the supervision, management, and control of national monuments contiguous to national forests the Secretary of Agriculture may cooperate with said National Park Service to such extent as may be requested by the Secretary of the Interior.

SEC. 3. That the Secretary of the Interior shall make and publish such rules and regulations as he may deem necessary or proper for the use and management of the parks, monuments, and reservations under the jurisdiction of the National Park Service, and any violations of any of the rules and regulations authorized by this Act shall be punished as provided for in section fifty of the Act entitled "An Act to codify and amend the penal laws of the United States," approved March fourth, nineteen hundred and nine, as amended by section six of the Act of June twenty-fifth, nineteen hundred and ten (Thirty-sixth United States Statutes at Large, page eight hundred and fifty-seven). He may also, upon terms and conditions to be fixed by him, sell or dispose of timber in those cases where in his judgment the cutting of such timber is required in order to control the attacks of insects or diseases or otherwise conserve the scenery or the natural or historic objects in any such park, monument, or reservation. He may also provide in his discretion for the destruction of such animals and of such plant life as may be detrimental to the use of any of said parks, monuments, or reservations. He may also grant privileges, leases, and permits for the use of land for the accommodation of visitors in the various parks, monuments, or other reservations herein provided for, but for periods not exceeding twenty years; and no natural curiosities, wonders, or objects of interest shall be leased, rented, or granted to anyone on such terms as to interfere with free access to them by the public: *Provided, however*, That the Secretary of the Interior may, under such rules and regulations and on such terms as he may prescribe, grant the privilege to graze live stock within any national park, monument, or reservation herein referred to when in his judgment such use is not detrimental to the primary purpose for which such park, monument, or reservation was created, except that this provision shall not apply to the Yellowstone National Park.

SEC. 4. That nothing in this Act contained shall affect or modify the provisions of the Act approved February fifteenth, nineteen hundred and one, entitled "An Act relating to rights of way through certain parks, reservations, and other public lands."

Approved, August 25, 1916.

AN ACT FOR THE PRESERVATION OF AMERICAN ANTIQUITIES.

(34 Stat., 225.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person who shall appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than $500 or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

SEC. 2. That the President of the United States is hereby authorized, in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and may reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected: *Provided*, That when such objects are situated upon a tract covered by a bona fide unperfected claim or held in private ownership, the tracts, or so much thereof as may be necessary for the proper care and management of the object, may be relinquished to the Government, and the Secretary of the Interior is hereby authorized to accept the relinquishment of such tracts in behalf of the Government of the United States.

SEC. 3. That permits for the examination of ruins, the excavation of archæological sites, and the gathering of objects of antiquity upon the lands under their respective jurisdictions may be granted by the Secretaries of the Interior, Agriculture, and War to institutions which they may deem properly qualified to conduct such examination, excavation, or gathering, subject to such rules and regulations as they may prescribe: *Provided*, That the examinations, excavations, and gatherings are undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation in public museums.

SEC. 4. That the Secretaries of the departments aforesaid shall make and publish from time to time uniform rules and regulations for the purpose of carrying out the provisions of this act.

Approved, June 8, 1906.

Statement of National Park Policy.

DEPARTMENT OF THE INTERIOR.
Washington, May 13, 1918.

DEAR MR. MATHER: The National Park Service has been established as a bureau of this department just one year. During this period our efforts have been chiefly directed toward the building of an effective organization while engaged in the performance of duties relating to the administration, protection, and improvement of the national parks and monuments, as required by law. This constructive work is now completed. The new Service is fully organized; its personnel has been carefully chosen; it has been conveniently and comfortably situated in the new Interior Department Building; and it has been splendidly equipped for the quick and effective transaction of its business.

For the information of the public an outline of the administrative policy to which the new Service will adhere may now be announced. This policy is based on three broad principles: "First, that the national parks must be maintained in absolutely unimpaired form for the use of future generations as well as those of our own time; second, that they are set apart for the use, observation, health, and pleasure of the people; and third, that the national interest must dictate all decisions affecting public or private enterprise in the parks."

Every activity of the Service is subordinate to the duties imposed upon it to faithfully preserve the parks for posterity in essentially their natural state. The commercial use of these reservations, except as specially authorized by law, or such as may be incidental to the accommodation and entertainment of visitors, will not be permitted under any circumstances.

In all of the national parks except Yellowstone you may permit the grazing of cattle in isolated regions not frequented by visitors, and where no injury to the natural features of the parks may result from such use. The grazing of sheep, however, must not be permitted in any national park.

In leasing lands for the operation of hotels, camps, transportation facilities, or other public service under strict Government control, concessioners should be confined to tracts no larger than absolutely necessary for the purposes of their business enterprises.

You should not permit the leasing of park lands for summer homes. It is conceivable, and even exceedingly probable, that within a few years under a policy of permitting the establishment of summer homes in national parks, these reservations might become so generally settled as to exclude the public from convenient access to their streams, lakes, and other natural features, and thus destroy the very basis upon which this national playground system is being constructed.

You should not permit the cutting of trees except where timber is needed in the construction of buildings or other improvements within the park and can be removed without injury to the forests or disfigurement of the landscape, where the thinning of forests or cutting of vistas will improve the scenic features of the parks, or where their destruction is necessary to eliminate insect infestations or diseases common to forests and shrubs.

In the construction of roads, trails, buildings, and other improvements, particular attention must be devoted always to the harmonizing of these improvements with the landscape. This is a most important item in our program of development and requires the employment of trained engineers who either possess a knowledge of landscape architecture or have a proper appreciation of the esthetic value of park lands. All improvements will be carried out in accordance with a preconceived plan developed with special reference to the preservation of the landscape, and comprehensive plans for future development of the national parks on an adequate scale will be prepared as funds are available for this purpose.

Wherever the Federal Government has exclusive jurisdiction over national parks it is clear that more effective measures for the protection of the parks can be taken. The Federal Government has exclusive jurisdiction over the national parks in the States of Arkansas, Oklahoma, Wyoming, Montana, Washington, and Oregon, and also in the Territories of Hawaii and Alaska. We should urge the cession of exclusive jurisdiction over the parks in the other States, and particularly in California and Colorado.

There are many private holdings in the national parks, and many of these seriously hamper the administration of these reservations. All of them should be eliminated as far as it is practicable to accomplish this purpose in the course of time, either through congressional appropriation or by acceptance of donations of these lands. Isolated tracts in important scenic areas should be given first consideration, of course, in the purchase of private property.

Every opportunity should be afforded the public, wherever possible, to enjoy the national parks in the manner that best satisfies the individual taste. Automobiles and motorcycles will be permitted in all of the national parks; in fact, the parks will be kept accessible by any means practicable.

All outdoor sports which may be maintained consistently with the observation of the safeguards thrown around the national parks by law will be heartily indorsed and aided wherever possible. Mountain climbing, horseback riding, walking, motoring, swimming, boating, and fishing will ever be the favorite sports. Winter sports will be developed in the parks that are accessible throughout the year. Hunting will not be permitted in any national park.

The educational, as well as the recreational, use of the national parks should be encouraged in every practicable way. University and high-school classes in science will find special facilities for their vacation-period studies. Museums containing specimens of wild flowers, shrubs, and trees, and mounted animals, birds, and fish native to the parks, and other exhibits of this character will be established as authorized.

Low-priced camps operated by concessioners should be maintained, as well as comfortable and even luxurious hotels wherever the vol-

ume of travel warrants the establishment of these classes of accommodations. In each reservation, as funds are available, a system of free camp sites will be cleared, and these grounds will be equipped with adequate water and sanitation facilities.

As concessions in the national parks represent in most instances a large investment, and as the obligation to render service satisfactory to the department at carefully regulated rates is imposed, these enterprises must be given a large measure of protection, and, generally speaking, competitive business should not be authorized where a concession is meeting our requirements, which, of course, will as nearly as possible coincide with the needs of the traveling public.

All concessions should yield revenue to the Federal Government, but the development of the revenues of the parks should not impose a burden upon the visitor.

Automobile fees in the parks should be reduced as the volume of motor travel increases.

For assistance in the solution of administrative problems in the parks relating both to their protection and use the scientific bureaus of the Government offer facilities of the highest worth and authority. In the protection of the public health, for instance, the destruction of insect pests in the forests, the care of wild animals, and the propagation and distribution of fish, you should utilize their hearty cooperation to the utmost.

You should utilize to the fullest extent the opportunity afforded by the Railroad Administration in appointing a committee of western railroads to inform the traveling public how to comfortably reach the national parks; you should diligently extend and use the splendid cooperation developed during the last three years among chambers of commerce, tourist bureaus, and automobile highway associations for the purpose of spreading information about our national parks and facilitating their use and enjoyment; you should keep informed of park movements and park progress, municipal, county, and State, both at home and abroad, for the purpose of adapting, whenever practicable, the world's best thought to the needs of the national parks. You should encourage all movements looking to outdoor living. In particular, you should maintain close working relationship with the Dominion parks branch of the Canadian department of the interior and assist in the solution of park problems of an international character.

The department is often requested for reports on pending legislation proposing the establishment of new national parks or the addition of lands to existing parks. Complete data on such park projects should be obtained by the National Park Service and submitted to the department in tentative form of report to Congress.

In studying new park projects you should seek to find scenery of supreme and distinctive quality or some natural feature so extraordinary or unique as to be of national interest and importance. You should seek distinguished examples of typical forms of world architecture, such, for instance, as the Grand Canyon, as exemplifying the highest accomplishment of stream erosion, and the high, rugged portion of Mount Desert Island as exemplifying the oldest rock forms in America and the luxuriance of deciduous forests.

The national park system as now constituted should not be lowered in standard, dignity, and prestige by the inclusion of areas

which express in less than the highest terms the particular class or kind of exhibit which they represent.

It is not necessary that a national park should have a large area. The element of size is of no importance as long as the park is susceptible of effective administration and control.

You should study existing national parks with the idea of improving them by the addition of adjacent areas which will complete their scenic purposes or facilitate administration. The addition of the Teton Mountains to the Yellowstone National Park, for instance, will supply Yellowstone's greatest need, which is an uplift of glacier-bearing peaks; and the addition to the Sequoia National Park of the Sierra summits and slopes to the north and east, as contemplated by pending legislation, will create a reservation unique in the world, because of its combination of gigantic trees, extraordinary canyons, and mountain masses.

In considering projects involving the establishment of new national parks or the extension of existing park areas by delimitation of national forests, you should observe what effect such delimitation would have on the administration of adjacent forest lands, and, wherever practicable, you should engage in an investigation of such park projects jointly with officers of the Forest Service, in order that questions of national park and national forest policy as they affect the lands involved may be thoroughly understood.

Cordially, yours,

FRANKLIN K. LANE,
Secretary.

Mr. STEPHEN T. MATHER,
Director, National Park Service.

DECISION OF THE COMMISSIONER OF THE GENERAL LAND OFFICE IN REFERENCE TO THE CAMERON MINING LOCATIONS IN GRAND CANYON NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE
Washington, D. C., May 12, 1919.

UNITED STATES VS. RALPH H. CAMERON ET AL., INVOLVING CHARGES AGAINST MINING CLAIMS IN GRAND CANYON NATIONAL PARK. MOTION TO REOPEN DENIED; DECISION AFFIRMED.

REGISTER AND RECEIVER, *Phoenix, Ariz.*

SIRS: This case is before the office on appeal filed June 28, 1918, from your decision of May 25, 1918, and a motion to reopen and remand the case for the taking of testimony, filed with the appeal.

Proceedings were directed by office letters "FS" dated in March and April, 1913, and directing adverse proceedings against the following mining locations, to wit: Banjo, Millionaire, Sentinel Treasure, Peg Leg, Hill Top, Sunflower, Limestone, Goldenola, Ida May and Buttinsky, lode claims, Cheyenne, Dakotah, Bannock, Apache, Folly, Hermit, and Gorge placer claims, alleged to have been located in 1906 and 1907 by Ralph W. Cameron et al., and embracing lands in T. 31 N., Rs. 2 and 3 E., G. and S. R. M., and within the Tusayan National Forest and the Grand Canyon National Monument. By said letter you were directed to give notice that a forest ranger charged that the land covered by said locations is nonmineral in character, that a discovery of mineral had not been made to support the alleged locations, and that the locations were not made in good faith for the purpose of developing mining proposition, but were made for speculative purposes in connection with the use of the land for trade or business.

Notice of the charges having issued on May 19, 1913, answers were filed by claimant Ralph H. Cameron on June 19, 1913, denying the charges and asking for hearings. Hearings were set for October 7, 1913, but were continued to various dates until August 10, 1915. By stipulation the cases were consolidated at the hearing. On the day set for the hearing a special agent, an assistant to the solicitor, Department of Agriculture, and the Chief of Field Division appeared in support of the charges, and the defendants were represented by counsel. Upon advice that the defendants had filed in the United States Court a suit to enjoin the Land Department from proceeding further against the claims, the hearing was continued until August 12, 1915, on which date, by agreement of the parties, the testimony of witnesses produced in support of the charges was taken and a number of depositions in support of the charges filed. Orders of continuance were then entered from time to time because of the procedings in court, until November 19, 1915, when the defendants declining to offer evidence, the hearing was closed.

By said decision of May 26, 1918, you found that the locations were made primarily and conclusively for speculative advantages, that no valid discovery of mineral had been made, and that the land is essentially nonmineral, and recommended that the necessary procedure to secure the cancellation of the locations and restoration of the land to the National Monument be taken.

The appeal alleges error of law in your findings, in that jurisdiction over the matters existed exclusively in the courts, and the motion to reopen the case for the purpose of taking testimony is made a part of the appeal. In this motion it is alleged that the claims contain large quantities of valuable minerals, particularly platinum.

The motion to reopen the hearing has been supplemented by a request filed in this office April 11, 1919, by local counsel for the United States Platinum Company, the alleged owner of the claims, and with whom said Cameron is associated, with which were filed affidavits of said Cameron and of Charles H. Kerk,

of Malvern, Pennsylvania, who represents himself to be the secretary and treasurer of the J. Bishop & Company Platinum Works of the same place, and a number of copies of assay certificates purported to have been made by J. Bishop & Co. and others. With these papers is a letter signed by said Cameron and dated March 29, 1919, in which he states that he has disposed of his interest in the Millionaire, Sentinel Treasure, Peg Leg, Sunflower, Limestone, Goldenola, Ida May, Buttinsky, and Hill Top lode claims, and the Hermit, Gorge, and Folly placer claims to one C. Frank Doebler, who he understands has conveyed to the Santa Fe Pacific Railroad Company, and that he has no interest in said claims or in the proceedings involving them, and disclaims any interest therein. His motion to reopen the case for the introduction of evidence applies therefore only to the Apache, Cheyenne, Bannock, and Dakotah placer locations and the Banjo lode location. The motion to reopen is predicated on the allegation that the claims contain valuable platinum deposits, because of which they were purchased by the United States Platinum Company, and the copies of assay certificates have been filed in support of the allegation that the land contains such deposits. The movant also urges in support of his motion that at the time the hearing was held he was proceeding in the court in good faith and upon reasonable grounds to determine the jurisdiction of the Land Department over the subject matter, and further, that after the court had decided against his contention that the Land Department was without jurisdiction, the decision was rendered by you without giving opportunity to him to offer evidence in his behalf.

At the hearing a forest ranger testified as to the situs of the various locations and the physical characteristics of the area involved; an associate geologist of the United States Geological Survey, a forest supervisor, a mineral inspector of this office and a mineral inspector of the Forest Service, testified as to the geology and mineralogy of the lands embraced in the claims, and the deposition of a practical miner on the same features was introduced. Other depositions of chemists and assistants as to the result of assays of samples submitted to them of materials taken from the land by the witnesses were also filed. The testimony of these witnesses indicates that an unusually thorough examination of the land had been made, samples taken and tested carefully, and amply sustained your decision. The results of the assays made of samples taken from the claims showed no appreciable values in gold, silver, or copper, and the platinum content ascertained was practically nil. Considering the evidence in the records, all of which was adduced in support of the charges, as aforesaid, the charges that the land is nonmineral in character and that no discovery of mineral had been made on any of said claims, have been established thereby. It is not necessary, therefore, to consider the charge questioning the bona fides of the locators.

Considering the motion to reopen the hearing, it appears from the record that notice of the hearing was given by your office on June 18, 1915, setting the same for August 10, 1915, before the register and receiver; that on August 5, 1915, Cameron filed a plea to the jurisdiction of the Land Department, and on the day of the hearing moved for a continuance on account of absent witnesses. He also insisted on his plea to the jurisdiction, citing in its support a decision rendered by the department October 24, 1914, known as the J. P. Nichols and Cy Smith case, wherein it was held that the Land Department was without jurisdiction to proceed against mining locations where no application for patent was pending. On the same day he filed a bill in equity before the United States district judge at Prescott, seeking to enjoin the register and receiver from proceeding with the hearing. On being advised of the court proceedings, the hearing was continued until August 12, 1915, at which time the parties appeared, the motion for a continuance was denied and the demurrer to the jurisdiction of the Land Department overruled, and after the evidence in support of the charges had been completed, as aforesaid, the hearing was continued from time to time until after the district court had denied the application for an injunction. It appears that the defendants filed an appeal from the decree of the court, but that the same was not prosecuted. Instead, on December 8, 1915, said Cameron filed a bill in equity in the Supreme Court of the District of Columbia against the Secretary of the Interior, the Commissioner of the General Land Office, and the register and receiver of your office. This proceeding resulted in a decision in favor of the applicant on March 15, 1916, and an appeal having been taken to the Court of Appeals of the District of Columbia, the lower court was reversed and the jurisdiction of the Land Department sus-

tained by decision dated November 14, 1916 (46 L. D., 195). By decision dated February 6, 1917 (48 L. D., 20), the decision in the Nichols and Smith case of October 24, 1913, was reversed and the authority of the Land Department to inquire into and determine the validity of mining locations in national forests, notwithstanding the locators have not applied for patent, was sustained. The decision of the Court of Appeals became final, no appeal therefrom having been taken. The movant alleges that he failed to take an appeal through mistake of his counsel and that it was his purpose to appeal therefrom.

Action on the contest record having been suspended by order of this office of December 13, 1915, because of said suit in the Supreme Court of the District of Columbia, after the decision of the Court of Appeals had become final, by office letter "FS" of February 11, 1918, the suspension was removed and you were directed to proceed with the case. The movant complains that this action was taken without notice to him, but since the hearing had been closed, as aforesaid, there was no reason for giving the defendants notice unless the case was to be reopened for the taking of further evidence, which was not contemplated. There was then pending no application for reopening the hearing.

In his affidavit filed with the supplemental showing in support of the motion to reopen the hearing, the defendant Cameron alleges that about 16 years ago Dr. C. T. Hennig examined the deposits on the claims and took samples and reported that they contained platinum; that in 1917 five samples were taken from the claims and shipped to the J. Bishop & Company Platinum Works where they were analyzed and gave returns of from 1.70 to 2.83 ounces of platinum per ton; that in 1917 J. M. Boutwell, an eminent mining engineer, took samples from the property which were assayed by said J. Bishop & Company, six of which averaged 0.344, two 0.400, seven 1.452, and the highest 2.400 ounces per ton of platinum; also in 1917 P. Overfield, a mining man, took three samples from the property which were assayed by said J. Bishop & Company and gave results of 0.30, 0.26, and 0.24 ounces of platinum per ton; that in 1918 A. C. Simkins, a mining engineer, took samples from the property which were analyzed by said J. Bishop & Company and which gave results as high as 0.30 ounces of platinum per ton; that in the summer and fall of 1917 said J. M. Boutwell and the affiant spent altogether seven weeks on the property and took in the neighborhood of 400 samples, part of which were sent to different chemists and assayers. Copies of purported assay certificates of these samples are filed. Of these that of said J. Bishop & Company show results of from 0.233 to 2.400 ounces of platinum per ton, Smith, Emery & Company show the highest as 0.0216 of an ounce of platinum per ton, while a large majority of the something less than 300 samples analyzed show "nil" or "trace". A certificate showing 38 samples assayed by Van Schulz and Lowe, of Denver, show no platinum in all but one sample, which gives 0.17 ounce per ton. Copy of a certificate which appears to be by the General Engineering Company, of Salt Lake City, giving returns of Smith, Emery & Company and Black & Deason of two samples furnished by said Boutwell show 0.027 or less ounce of platinum per ton. Another certificate of the J. Bishop & Company Platinum Works shows platinum in practically all of the 38 samples assayed, ranging from 0.05 to 0.20 ounces per ton, or an average of probably about 0.10 ounce per ton. Another certificate of the said company of 70 samples assayed shows one result of 2.3 ounces and the remainder either "blank" or "trace". Another certificate of 36 samples by the same company shows one result of 7.07 ounces, one of 0.16, four of 0.14, and some lesser results, and a number of traces and blanks. A statement of the results obtained from the samples furnished by said Boutwell in 1917 and 1918 shows that only J. Bishop & Company were able to obtain appreciable platinum results, ranging from 2.400 ounces per ton down to nothing, the great majority showing nothing. This list includes over 300 samples.

Counsel for the movant calls attention to the difference between the results obtained by the assayers, especially those of Ledoux and Company of New York, whose assays were introduced as evidence at the hearing, and those obtained by J. Bishop & Company, and filed an affidavit by Charles H. Kerk of the J. Bishop & Company Platinum Works, in which it is asserted that the platinum can not be obtained by gravity concentration, the ordinary method of analyzing for this mineral, and that his company has worked out processes for the recovery of platinum in the deposits in question which he believes makes material containing as low as 0.20 ounces per ton commercially profitable to mine, that in making the assays they use the most approved and accurate process for getting the actual platinum content, that his experience and the

experiences of his company has proved that the usual methods of assayers will not work entirely successful with the ores from these claims, and that the method used by him was devised after failure to recover platinum by the usual methods. The showing of platinum in the claims made by the movant in support of his motion rests entirely upon the results obtained by said Bishop & Company, and is contradicted by the results obtained by Smith, Emery & Company, Ledoux & Company, Van Schulz & Lowe, and Black & Deason, of Salt Lake City. In addition a number of assays have been made by the U. S. Geological Survey. A report dated February 24, 1919, by F. L. Ransome of that bureau has been furnished by the director. In this Dr. Ransome reports that he made some examination in the summer of 1918 on the claims, carefully choosing two samples as representative of the alleged ore, each of which he divided into three parts, one being assayed by the Bureau of the Mint, one by the Bureau of Standards, and the third in the laboratory of the United States Geological Survey. Only a very inconsequential amount of platinum was found by the assayers. In the conclusion of his report Dr. Ransome says:

As a result of these investigations it may be safely stated that the supposed platinum deposits in the Grand Canyon do not contain platinum. Certainly not enough to be of any value. The claim that the platinum is present in some form that would prevent its detection by the various methods in the three Government laboratories mentioned may be dismissed as an absurdity. A metal in colloidal solution is merely in such a very fine state of division that it remains in suspension in a clear or opalescent liquid. Its chemical properties, however, are not changed by transformation to the colloidal state, and there is no difficulty in precipitating the metal from a colloidal solution by using the proper treatment.

In connection with the data filed with the motion to reopen the hearing the Director of the United States Geological Survey has supplied a signed copy of a report of John M. Boutwell, made under date of March 18, 1919, to the United States Platinum Company, in which he states that he had studied the ground geologically, the possible ore-bearing formations having been systematically sampled, 275 samples taken and assayed in duplicate or triplicate, special chemical work done and duplicate concentration tests made; that in all this work the utmost practicable endeavor had been made according to the best known practice to secure correct results as a basis for ascertaining the truth. Concluding he says—

These results show that platinum ore has not been found in the ground examined in form and grade of commercial value.

In his letter transmitting the copy he states—

This is the first and sole report on the Indian Gardens property in Grand Canyon, Ariz. This action is also in accordance with agreement between the owners and myself.

This report is given consideration especially because it was upon the representations of the movant that he had employed said Boutwell to make a thorough examination of the claims and desired to have the results of such examination considered, that action on the hearing record has been postponed for several months. In view of the representations as to the qualifications of this engineer and the character and extent of the investigation of the deposits on the claims made by him, his conclusion that the land contains no platinum values is convincing and entitled to great weight.

Considering the facts shown by the record as made up, the showing submitted by the movant, the published report of Dr. Ransome as information furnished by the U. S. Geological Survey, a coordinate bureau of the Department, and the report of said Boutwell, also furnished by that Bureau, no sufficient reason for reopening the hearing to allow additional evidence to be submitted and thereby delay final action on the case, is found. On the contrary, I am convinced that a further hearing would only delay final action in the case. The land is now within the Grand Canyon National Park, under Act of Congress approved February 26, 1919 (Public No. 277). The act creating the park does not prevent development of any valuable mineral deposits that may be discovered thereon, provision being made (Sec. 6),

That whenever consistent with the primary purposes of said park, the Secretary of the Interior is authorized, under general regulations, to be prescribed to him, to permit the prospecting, development, and utilization of the mineral resources of said park upon such terms and for specified period or otherwise, as he may deem to be for the best interest of the United States.

The motion to reopen the hearing is accordingly denied. Your decision is affirmed, and the said alleged locations and each of them are hereby adjudged to be null and void and of no effect, that the land covered by said locations was not excepted from the reservations creating the Grand Canyon National Monument, and the Grand Canyon National Park, and said lands will be administered as a part of said park, if this decision becomes final.

Thirty days from notice will be allowed the claimants within which to file appeal herefrom.

Very respectfully,

CLAY TALLMAN,
Commissioner.

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OUR NATIONAL PARKS IN WINTER.

It is commonly assumed that the national parks of the United States serve their recreational purpose only in the summer time. Winter conditions are supposed to render them inaccessible, for the most part, and even where accessible the rigors of winter are supposed to be so severe as to preclude all possible enjoyment. This is a mistaken idea. Nearly all of the national parks furnish in winter scenes of striking beauty and sublimity such as are found in no other season of the year; and while it is not always easy to reach these scenes, owing to the depth of snow and the lack of transportation, it is the emphatic and universal testimony of those who have visited the parks in winter that the extra exertion required is far more than repaid by the splendid exhilaration of the trip and the superb views which are afforded.

The Hot Springs Reservation, in Arkansas, is, of course, readily accessible, and fulfills the same health-restoring mission in winter as in summer.

The Grand Canyon National Park, in Arizona, is also easily reached, and has almost as many visitors during the winter months as during the summer. Snow is practically unknown in the depths of the canyon, and while it occasionally falls along the rim, there is never a sufficient quantity to interfere with one's full enjoyment of the magnificent views which have caused the Grand Canyon to be worthily rated as "the first wonder of the world."

Lafayette National Park, on Mount Desert Island, off the coast of Maine, is likewise easily reached under ordinary winter conditions; and while there are some days when the thermometer records a low temperature, and while many of the roads and trails through the park are of necessity left unbroken through the winter, there are so many interesting natural phenomena and so many opportunities for winter sports in great variety that the park bids fair, in coming days, to be recognized as a winter resort possessing exceptional attractions.

Yellowstone National Park, in Wyoming, is heavily snowbound during winter, and a tour of the park can be made only on snowshoes or, under favorable conditions, on horseback. Those who have visited the park in winter, however, have come back with thrilling tales of indescribable beauty, especially in connection with the hot springs and geysers, where Jack Frost exhibits some of the most fascinating specimens of his handiwork. The Grand Canyon of the Yellowstone, too, is a snowy fairyland, while the bands of elk which come down from the mountains to feed in the park offer many novel and picturesque sights.

Glacier National Park, in Montana, is another snowy wilderness in wintertime; but whoever has the opportunity and the courage to accompany one of the park rangers on one of his winter trips will find ample reward in beholding scenes of grandeur which outrival in impressiveness anything which the summer season yields.

As a rule the snowfall in the Rocky Mountain National Park, in Colorado, is very slight, except upon the highest ranges, and the winter temperature is mild. Estes Park, the main entrance to the reservation, can always be reached by automobile, and some of the hotels keep open through the winter. Already there has been a considerable development in the way of winter sports—skating, skiing, snowshoeing, tobogganing, etc.—within the park, and this development promises to be greatly enlarged in the near future. Needless to say the Continental Divide has unsuspected glories to reveal to those who know the mountains only in their summer aspect. See Enos Mills's stories of his winter experiences on Longs Peak.

Mesa Verde National Park, in Colorado, is somewhat off the main lines of travel, east and west; but there is no reason why its delightful scenery and the fascinating mystery of its prehistoric cliff dwellings may not be enjoyed in winter as well as in summer.

Mount Rainier National Park, in Washington, is rapidly coming to be known as a treasure house of wonder and beauty in the wintertime. The snowfall is usually very heavy, but the National Park Inn can be reached by automobile in four or five hours from Tacoma or Seattle, and from this as headquarters various excursions may be taken on snowshoes or skis to points of supreme interest and beauty. Except when there is a severe wind, the temperature is mild and genial; overcoats and gloves are oftentimes unnecessary, and there is a tonic in the air which dwellers on the lowlands know nothing of whatever. The trip to Paradise Inn, 5 miles up the mountain, is especially to be recommended. The trail runs through an evergreen forest which, under the decoration of the snow, abounds in views of exquisite charm, with now and then glimpses of the superb peaks of the Tatoosh Range and the Great Mountain itself, clad in robes of utmost purity—a spectacle of combined majesty and beauty unsurpassed anywhere on the continent. Paradise Inn does not claim "to be open" in the winter but visitors can be accommodated here, and a single night spent at this altitude (5,500 feet above the sea), with its attendant glories of sunset and sunrise is an adventure never to be forgotten. Last Christmas time 55 members of "The Mountaineers"—an outdoor club of Seattle—reached Camp Muir, at an elevation of 10,000 feet on the mountain—a holiday trip of intense enjoyment and inspiration.

Crater Lake National Park, in Oregon, also has a heavy snowfall, yet the lake rarely, if ever, freezes over. The same scenes of wonder and beauty which enchant the visitor in summer time are found here in winter, with the added glory of the snow. The distance of Crater Lake from ordinary travel routes operates against its becoming a popular winter resort; but those who have succeeded in penetrating to its snowy fastness have returned enthusiastic over the pleasures of the trip and the sublime scenic views which formed its climax.

The forests of the Sequoia and General Grant National Parks, in California, present views of rare beauty in their winter dress. The big trees, yellow pines, sugar pines, silver firs, incense cedars, etc., bear their snowy burdens most gracefully, and one feels a new sense of reverence in wandering beneath the fretted domes of their interlacing branches so exquisitely adorned.

The proposed Roosevelt National Park, which will include the present Sequoia Park besides the loftiest section of the High Sierra of California, must remain, in large part, a terra incognita to winter tourists until it is made more accessible by roads and trails. When these are provided, however, it is safe to say that no region of the Far West will furnish more abundant or more conspicuous examples of winter's glory than this noble park.

Yosemite National Park is about to enter upon a new era. The prospective speedy completion of the new million-dollar automobile highway from Merced to El Portal, giving direct and easy access to Yosemite Valley, will make this a genuine all-the-year-round resort. Yosemite is certain to receive a throng of winter visitors, and already a goodly number have discovered its alluring attractions. The snowfall varies with the season, from a few inches to two feet; but there is normally plenty of opportunity for winter sports, and a winter carnival in Yosemite is an event of the not distant future. To San Francisco and other snowless cities of California this will be an occasion of immense interest. Regardless of the quantity of snow, however, Yosemite in winter possesses a unique and varied charm. John Muir spent ten winters in the valley, and this is his story of the "white months:"

> I was out every day, and often all night, sleeping but little, studying the so-called wonders and common things ever on show, wading, climbing, sauntering among the blessed storms and calms, rejoicing in almost everything alike that I could see or hear; the glorious brightness of frosty mornings, the sunbeams pouring over the white domes and crags into the groves and waterfalls, kindling marvelous iris fires in the hoarfrost and spray; the great mountains in their deep noon sleep; the good-night alpenglow; the stars; the solemn gazing moon, drawing the huge domes and headlands one by one glowing white out of the shadows hushed and breathless like an audience in awful enthusiasm, while the meadows at their feet sparkle with frost-stars like the sky; the sublime darkness of storm-nights, when all the lights are out; the clouds in whose depths the frail snow flowers grow; the behavior and many voices of the different kinds of storms, trees, birds, waterfalls, and snow avalanches in the ever changing weather.

Beyond Yosemite Valley, up on the higher levels, where the snow lies 3 or 4 feet deep, there is a realm of radiant beauty which, while only within the reach of the more hardy and venturesome, is certain to be joyfully explored by many such in the coming days. A trip to Eagle Peak, North Dome, Cloud's Rest, Liberty Cap, Glacier Point, or Inspiration Point furnishes experiences of delight and visions of glory known only to those who yield to the lure of the heights. And as for Merced Canyon, Tenaya Lake, Tuolumne Meadows, Mono Pass, Lyell Fork, the Sierra Crown, Tuolumne Canyon, and the many other places of note in the remoter regions of the park, as yet we can only dream of what may be found there. Some day, perhaps not so very long hence, we shall know the reality.

HERBERT W. GLEASON.

ASSOCIATED MOUNTAINEERING CLUBS OF NORTH AMERICA.[1]

American Alpine Club.

President, Charles E. Fay, Tufts College, Mass.
Vice presidents, L. L. Delafield, 20 Exchange Place, New York; W. E. Colby, 402 Mills Building, San Francisco, Calif.
Secretary, R. H. Chapman, 2029 Q Street, Washington, D. C.
Treasurer, B. F. Seaver, 14 Wall Street, New York.
Librarian, Le Roy Jeffers, 476 Fifth Avenue, New York.
Membership.—Active, 88; honorary, 11; total, 99.
Dues.—Annual, $5; life, $50.
Organized 1902. Annual meeting held in Philadelphia, New York, or Boston in December or January.
Publications.—Alpina Americana, supplied by Williams & Wilkins Co., 2419 Greenmount Avenue, Baltimore, Md., at $0.85 a copy. No. 1, J. N. Le Conte, High Sierra of California, 1907; No. 2, C. E. Fay, Canadian Rocky Mountains, 1911; No. 3, A. H. Brooks, Mountain Exploration in Alaska, 1914; By-laws and register.
The club's collection of mountaineering books and photographs is deposited with the New York Public Library, at 476 Fifth Avenue.

American Forestry Association, 1410 H Street NW., Washington, D. C.

President, Charles L. Pack, 1410 H Street NW., Washington.
Secretary, Percival S. Ridsdale, 1410 H Street NW., Washington.
Treasurer, J. E. Jenks, 1410 H Street NW., Washington.
Membership.—Annual, subscribing, contributing, sustaining, life, patron. Total, 15,600.
Dues.—Subscribing, $3; contributing, $10; sustaining, $25; life, $100; patron, $1,000.
Organized 1882. Annual meeting in January.
Publication.—American Forestry (monthly), edited by P. S. Ridsdale, $3 a year. Free to members. Devoted to trees, parks, flowers, birds, and kindred subjects.
The association is working for the conservation and protection of the forests, flowers, and birds of the United States and Canada, and for a National Forest policy which will insure a production equal to national needs.

American Game Protective Association, 2271 Woolworth Building, New York City.

President, John B. Burnham, 233 Broadway, New York.
Vice president, E. A. Quarles, 233 Broadway, New York.
Secretary and treasurer, G. M. Fayles, 233 Broadway, New York.
Dues.—Member, $1 plus subscription to any one of several leading sportsmen's magazines, which carry monthly a department of wild-life conservation propaganda furnished by the association; club member (for organizations), $5; associate member, $25; sustaining member, $100; life member, $250; patron, $1,000; founder, $2,500.
Organized 1911. Annual meeting first Monday and Tuesday in March.
Publication.—Bulletin (quarterly), edited by R. P. Holland. Free to members.

[1] Data assembled by Le Roy Jeffers, secretary, 476 Fifth Avenue, New York City.

American Museum of Natural History, Seventy-seventh Street and Central Park West, New York City.

President, H. F. Osborn, Seventy-seventh Street and Central Park West.
Vice presidents, C. H. Dodge, J. P. Morgan.
Director, F. A. Lucas, Seventy-seventh Street and Central Park West.
Secretary, Adrian Iselin, Seventy-seventh Street and Central Park West.
Treasurer, H. P. Davison, Seventy-seventh Street and Central Park West.
Librarian, R. W. Tower, Seventy-seventh Street and Central Park West.
Membership.—Annual, 2,966; associate, 512; sustaining, 89; life, 793; fellow, 48; patron, 113; associate benefactor, 21; associate founder, 10; founder, 1; benefactor, 5; honorary fellow, 10; total, 4,568.
Dues.—Annual, $10; associate (nonresident), $3; sustaining, $25; life, $100; fellow, $500; patron, $1,000; associate benefactor, $10,000; associate founder, $25,000; benefactor, $50,000.
Founded 1869. Annual meeting, first Monday in February.
Publications.—Natural History (October to May), edited by Miss M. C. Dickerson, $2 a year; scientific publications comprising memoirs, bulletin, anthropological papers, monographs. Popular publications, comprising handbooks, leaflets, general guide; annual report.
The library of the American Museum consists of about 70,000 volumes on natural history, ethnology, and travel, and is located on the fifth floor of the museum building.

Adirondack Camp and Trail Club, Lake Placid Club, New York.

President (acting), Godfrey Dewey, Lake Placid Club, New York.
Vice president, E. A. Woods, Frick Building, Pittsburgh, Pa.
Secretary, T. M. Longstreth, Lake Placid Club, New York.
Treasurer, F. B. Guild, Lake Placid, New York.
Membership.—Active, 22; associate, 9; life, 1; honorary, 1; total, 33.
Annual dues.—Active, $10; associate, $5; life, $100.
Organized 1910. Annual meeting, middle of August.
The club keeps open about 50 miles of trails and 7 public camps in the Adirondacks.

Alpine Club of Canada,[1] Banff, Alberta, Canada.

Honorary president, Sir Edmund Walker, Toronto, Ontario.
President, J. D. Patterson, Woodstock, Ontario.
Vice presidents, C. H. Mitchell, Toronto, Ontario; W. W. Foster, Victoria, B. C.
Director, A. O. Wheeler, Sidney, B. C.
Secretary-treasurer, S. H. Mitchell, Sidney, B. C.

SECTIONS.

Toronto.—Chairman, C. B. Sissons; Secretary, R. A. Gray, 324 Markham Street.
Winnipeg.—Chairman, H. B. Mitchell; secretary, Miss D. E. Mitchell, 702 Dorchester Avenue.
Calgary.—Chairman, T. B. Moffat; secretary, L. C. Wilson, 111 Eighth Avenue East.
Edmonton.—Chairman, A. S. Matheson; secretary, Miss K. Sharpe, 23 Rene Le Marchand.
Vancouver.—Chairman, Rev. A. H. Sovereign; secretary, Miss A. C. Laird, 1053 Nicola Street.
Vancouver Island.—Chairman, R. D. McCaw; secretary, Miss J. L. McCulloch, 912 Linden Avenue, Victoria.
New York.—Chairman, B. F. Seaver; secretary, Miss C. B. Hinman, 189 Summit Avenue, Summit, N. J.
London, England.—Chairman, J. N. Collie; secretary, A. L. Mumm, 112 Gloucester Terrace, Hyde Park.

[1] Not a member of the association.

Membership.—Active, 462; life, 44; graduating, 102; associate, 2; subscribing, 26; honorary, 11; total, 647.

Entrance fee and dues.—Active, $7.50; graduating, $5.

Annual dues.—Active, $5; graduating, $2.50; associate, $25; subscribing, $2.

Organized 1906. Annual meeting held in July at camp.

Publications.—The Canadian Alpine Journal (annually), edited by A. O. Wheeler and S. H. Mitchell, $1.50 a copy; constitution and list of members.

Clubhouse and library.—Banff, Alberta, Canada. Open June to September. Rate, $2.75 a day.

1919 camp, July 22 to August 5 at Summit Lake, Yoho Pass, near Field. Expense, $3 a day.

Appalachian Mountain Club, 1050 Tremont Building, Boston, Mass.

President, P. W. Ayres, 4 Joy Street, Boston, Mass.

Vice presidents, A. H. Tucker, 6 Reedsdale Road, Milton, Mass.; Mortimer Bishop, 35 Hamilton Terrace, New York.

Recording secretary, W. F. Mattson, 1050 Tremont Building, Boston.

Corresponding secretary, A. B. Root, jr., 383 Dorchester Avenue, South Boston.

Treasurer, W. O. Witherell, 1050 Tremont Building, Boston.

Librarian, Miss A. G. Higgins, 1050 Tremont Building, Boston.

CHAPTERS.

New York.—Chairman, B. F. Seaver, 14 Wall Street, New York; secretary, H. S. Stillings, 61 Broadway, New York.

Outings.—Saturdays and holidays.

Worcester.—Chairman, A. H. Inman, 21 Germain Street, Worcester, Mass; secretary, W. M. Bassett, 35 Howard Street, Worcester, Mass.

Outings.—Saturdays and holidays.

Membership.—Annual, 1860; life, 283; corresponding, 48; honorary, 23; total 2,214.

Entrance fee and dues, $8; annual dues, $4; life, $50.

Organized 1876. Annual meeting: second Wednesday in January.

Publications.—Appalachia (annually and occasionally semi-annually), edited by C. E. Fay, $0.50 a copy; Bulletin (10 issues a year), edited by Miss A. G. Higgins; Register (annually); Guide to paths in the White Mountains and adjacent regions, 1917, $2; various booklets and maps are also published.

Club rooms and library.—1050 Tremont Building, Boston. Club house and camp on Three Mile Island, Lake Winnepsaukee, N. H., is open from June 28 to September 3, expense $2 a day. Rhododendron cottage at Fitzwilliam, N. H., is open by arrangement. Madison Spring Huts, Carter Notch Hut, and Lakes of the Clouds Hut in the White Mountains are open from July 1 to October 1. Meals and lodging at $1 each. Nine shelters in New Hampshire are also available without charge. About 237 miles of trail are maintained, and the club owns 16 reservations in Massachusetts, New Hampshire, and Maine.

Outings.—Saturdays, holidays, and Tuesday evenings in summer. Numerous excursions of from two days to two weeks throughout the year to eastern mountain regions. Annual snowshoe trip to New Hampshire in February.

1919 camp, August 2 to September 1, at Moosehead Lake, Me. Expense from Boston about $95. Two weeks, $55.

Boone and Crockett Club, 60 Wall Street, New York City.

President, G. B. Grinnell, 238 East Fifteenth Street, New York.

Vice presidents, Madison Grant, 111 Broadway, New York; W. B. Devereux, 120 Broadway, New York; Charles Sheldon, The Argyle, Washington; Owen Wister, 1004 West End Trust Building, Philadelphia; Archibald Rogers, Hyde Park-on-Hudson, N. Y.

Secretary, C. S. Davison, 60 Wall Street, New York.

Treasurer, W. R. Cross, 33 Pine Street, New York.

Membership.—Active, 100; associate, 57; total, 157.

Entrance fee and dues.—Active, $35; annual dues, $10.

Organized 1888. Annual meeting in January.

Publications: Yearbook; five volumes on big-game hunting.

The club is active in furthering the creation of national parks, forest reserves, and game refuges.

British Columbia Mountaineering Club, Vancouver, British Columbia, Canada.

President, C. J. Heaney, 724 Keith Road East, North Vancouver, B. C.
Vice presidents, Miss E. B. Fowler, 1121 Melville Street, Vancouver; W. A. Munday, 224 Twenty-ninth Avenue East, Vancouver.
Secretary, Mrs. H. E. Coulter, Post Office Box 1223, Vancouver, B. C.
Treasurer, L. C. Ford, Post Office Box 1223, Vancouver, B. C.
Membership—Active, 90; honorary, 3; total, 93.
Annual dues, $2.
Organized 1907. Annual meeting, Third Monday in March.
Club Cabin—On western slope of Grouse Mountain, reached via North Vancouver Ferry.
Outings—Week end and holiday climbing trips.
1919 outing, August 9 to 24, probably near Anderson Lake, in the Lillooet district. Expense from Vancouver, $35 to $40.

Colorado Mountain Club, Denver, Colo.

President, G. C. Barnard, 615 Seventeenth Street, Denver.
Vice president, H. F. Brooks, 1732 Welton Street, Denver.
Secretary, G. H. Harvey, Jr., 3120 West Twenty-third Avenue, Denver.
Treasurer, R. B. Rockwell, 513 California Building, Denver.

PIKES PEAK BRANCH, COLORADO SPRINGS, COLO.

President, J. E. Fuller; Manager, Lloyd Shaw; Secretary, Miss P. B. Turner.
Membership—Regular, 142; qualified, 303; honorary, 2; total, 447.
Annual dues, $3.
Organzied 1912. Annual meeting third Friday in January.
Publication—Trail and Timberline (monthly), edited by Miss Annette Badgley.
Club room at the Public Library, Denver.
Outings—Saturday and Sunday walks and holiday excursions. Annual snowshoe ski trip in February at Fern Lodge, Rocky Mountain National Park.
1919 outing, August 11 to 23, at Wild Basin, Rocky Mountain National Park. Expense from Denver, $40.80, or $3 per day in camp.

Field and Forest Club, Boston, Mass.

President, W. E. Nutting, 100 Franklin Street, Boston, Mass.
Vice presidents, S. A. Cummings, 64 Long Wharf, Boston; S. R. Porter, 18 Tarleton Road, Newton, Center, Mass.
Recording secretary, Miss A. B. Browne, 299 Center Street, Dorchester, Mass.
Corresponding secretary, Miss A. P. French, 36 Tennyson Street, Somerville, Mass.
Treasurer, O. H. Kent, 79 Center Street, Dorchester, Mass.
Membership—Active, 626.
Entrance fee and dues, $2; annual dues, $1; life, $15.
Organized 1904. Annual meeting, second Monday in November.
Publications—Monthly calendar; Yearbook.
Pequit Bungalow on south shore of Pequit Lake, Canton, Mass.
Outings—Saturdays, holidays; fall and winter excursions to the White Mountains.
1919 outings—July 5 to 19 at Eastville Inn, Martha's Vineyard, Mass.; expense at hotel $16 up per week. September 13 to 27 at Mount Crescent House, Randolph, N. H.; expense at hotel, $14 up per week.

Forest Service, United States Department of Agriculture, 930 F Street NW., Washington, D. C.

Forester and Chief, Henry S. Graves, 930 F Street NW., Washington.
Associate Forester, A. F. Potter, 930 F Street NW., Washington.
Organized 1905. Regular staff, 3,500.
Administers 151 national forests, 11 national monuments, and 3 national game preserves through seven district headquarters located at Missoula, Mont., Denver, Colo., Albuquerque, N. Mex., Ogden, Utah, San Francisco, Calif., Portland, Oreg., and Washington, D. C.

Branches of the service—Silviculture, grazing lands, research, engineering, acquisition of lands.

Publications: Bulletins and maps of many of the forests containing information for mountain travelers and campers. Specify the region desired.

Fresh-Air Club, New York City.

President, H. E. Buermeyer, Hotel St. George, Brooklyn.
Vice President, Brainerd Kellogg, Morristown, N. J.
Secretary, Mortimer Bishop, 88 Nassau Street, New York.
Treasurer, A. F. Ormsbee, 183 Joralemon Street, Brooklyn.
Membership—Active, 75.
Annual dues, $2.
Organized 1877. Annual meeting, fourth Saturday in January.
Outings, Sundays and holidays. Annual excursion to the Catskills, May 29 to June 1.

Geographic Society of Chicago, Chicago, Ill.

President, F. T. West, 68 Division Street, Chicago.
Vice Presidents, Frank Hamlin, W. S. Monroe, L. T. Chamberlin.
Recording Secretary, Mrs. B. B. Bohn, 10980 Prospect Avenue, Chicago.
Domestic Corresponding Secretary, Mrs. L. R. Frazeur, 814 South Michigan Avenue, Chicago.
Treasurer, O. M. Schantz, 10 South La Salle Street, Chicago.
Membership—Resident, 666; life, 38; patrons, 3; nonresident, 15; honorary, 7; total, 729.
Entrance fee and dues—Resident, $10; nonresident, $6.
Annual dues—Resident, $5; nonresident, $3; life, $100.
Organized 1898. Annual meeting, second Friday in May.
Publications: Bulletin on Geographic Studies, University of Chicago Press; Yearbook.
The society holds monthly and special meetings with lectures, conducts monthly excursions, and usually a western trip in the summer.

Geographical Society of Philadelphia, 400 Witherspoon Building, Philadelphia, Pa.

President, W. E. Lingelbach, 4304 Osage Avenue, Philadelphia.
Vice Presidents, H. G. Bryant, 2013 Walnut Street, Philadelphia; L. W. Miller, 320 South Broad Street, Philadelphia.
Recording Secretary, J. E. Buckenham, M. D., Municipal Hospital, Philadelphia.
Corresponding Secretary, P. J. Sartain, M. D., 2006 Walnut Street, Philadelphia.
Treasurer, W. K. Haupt, 104 South Fourth Street, Philadelphia.
Membership—Active, 899; nonresident, 34; life, 50; corresponding, 20; honorary, 15; total, 1,018.
Entrance fee and dues—Active, $10; nonresident, $2.
Annual dues—Active, $5; nonresident, $2; life, $100.
Organized 1891. Annual meeting, first Wednesday in May.
Publication: Bulletin of the Geographical Society of Philadelphia (quarterly), edited by H. G. Bryant, $2 a year.
Library of travel and reference at rooms of the society, 400 Witherspoon Building.
Outings, afternoon and all-day walks in the spring and autumn.

Green Mountain Club, (Inc.), 35 Mead Block, Rutland, Vt.

President, C. P. Cooper, 300 West Street, Rutland, Vt.
Vice President, L. J. Paris, 324 South Union Street, Burlington, Vt.
Clerk, G. E. Chalmers, 35 Mead Block, Rutland, Vt.
Corresponding Secretary, T. S. Dean, Masonic Temple, Burlington, Vt.
Treasurer, E. S. Marsh, Brandon, Vt.

SECTIONS.

Bennington.—President, J. L. Griswold; secretary, Miss Maude Harris.
Blue Mountain, Ryegate, Vt.—President, W. D. White; secretary, Miss O. J. McLam.
Burlington.—President, Mrs. C. P. Cowles, 100 Ledge Road; secretary, Miss C. M. Huntington, 325 Pearl Street.
Killington, Rutland, Vt.—President, G. G. Marshall; secretary, W. M. Ross.
New York, N. Y.—President, W. S. Monroe, 33 Portland Place, Montclair, N. J.; secretary, A. C. Tate, Stamford, Conn.
Outings.—Saturdays, Sundays and holidays.
Sterling, Johnson, Vt.—President, C. H. Willey; secretary, F. W. Hazen.
Membership.—Active, 604; life, 7; total, 611.
Annual dues, $1; New York section, $1.50; life, $25.
Organized 1910. Annual meeting, second Wednesday in January. The club has about 175 miles of trails, and erects shelters in Vermont.
Publication, guide book.

Hawaiian Trail and Mountain Club, Honolulu, Hawaii.

President, W. F. Frear, Honolulu, Hawaii.
Vice-president, J. S. Donaghho, Honolulu, Hawaii.
Secretary-treasurer, A. H. Ford, Honolulu, Hawaii.
Organized 1910. Membership—Active, 109.
Annual dues, $5.
The club constructs and maintains mountain trails, and conducts Sunday walks and climbing excursions on the various islands.

Klahhane Club, Port Angeles, Wash.

President, E. B. Webster, Port Angeles, Wash.
Vice-President, Miss Helen Hanson, Port Angeles, Wash.
Secretary, Miss Ruth Lee, Port Angeles, Wash.
Treasurer, Frank Dann, Port Angeles, Wash.
Membership.—Active, 96; honorary, 5; total, 101.
Entrance fee and dues, $2; annual dues, $1.
Organized 1914. Annual meeting, third Wednesday in January.
Publication.—Yearbook, edited by E. B. Webster, $0.50.
Lodge on slopes of Mt. Angeles.
Outings, Saturdays and Sundays.
1919 outing, August 16 to 24 in the Olympic Mountains. Expense, $15.

Mazamas, 322 Chamber of Commerce Building, Portland, Oreg.

President, E. C. Coursen, 658 Lovejoy Street, Portland.
Vice President, Miss H. E. Monroe, 1431 East Salmon Street, Portland.
Recording Secretary, Miss Jean Richardson, 131 East Nineteenth Street, Portland.
Corresponding Secretary, Mrs. B. M. Carl, 629 East Ash Street, Portland.
Treasurer, Miss Marion Schneider, 260 Hamilton Avenue, Portland.
Membership.—Active, 399; life, 4; honorary, 8; total, 411.
Annual dues, $3; life, $50.
Organized 1894. Annual meeting, first Monday in October.
Publication, Mazama (annually), edited by G. W. Wilder, $0.50.
Club rooms and library, 332 Chamber of Commerce Building.
Mazama exhibit in Oregon Building, Fifth and Oak Streets, Portland.
Outings: Saturdays, Sundays, and holidays. Annual Mount Hood outing, July 12 to 13.
1919 outing, August 2 to 17, on the south side of Mount Rainier, near Paradise Valley. Expense from Portland, $48 ($53 to nonmembers).

Mountaineers, 230 Central Building, Seattle, Wash.

President, E. S. Meany, 4025 Tenth Avenue NE., Seattle.
Vice President, R. H. McKee, Houghton, Wash.
Secretary, E. W. Allen, 402 Burke Building, Seattle.
Treasurer, F. G. Pugsley, 911 Lowman Building, Seattle.

BRANCHES.

Everett.—Chairman, G. D. Thompson, 2429 Baker Avenue; Secretary, Miss Catherine Crayton, 3109 Colby Avenue. Outings, Sundays and holidays.

Tacoma.—President, J. H. Weer, Miller Apartments; Secretary, Miss M. H. Mudgett, 314 Tacoma Building. Outings, Sundays and holidays.

Membership.—Active, 508; life, 2; honorary, 3; total, 513.

Entrance fee and dues.—Residents of Kings County, $5; non-residents, $4.

Annual dues.—Active, residents of Kings County, $4; nonresidents, $3, contributing, $10; life, $100.

Organized 1907. Annual meeting, third Friday in October.

Publications.—The Mountaineer (annually), edited by J. T. Hazard, $0.50; Mountaineer Bulletin (monthly), edited by J. T. Hazard.

Club rooms and library, 230 Central Building, Seattle.

Snoqualmie Lodge, near Rockdale, on Chicago, Milwaukee & St. Paul Railway; Kitsap Lodge in Rhododendron Park, a 74-acre reservation owned by the club near Chico, Kitsap County.

Outings, Sundays and holidays. Annual New Year snowshoe outing in Mt. Rainier National Park.

Nineteen hundred and nineteen outing, July 26 to August 16. Circuit of Mount Rainier, starting from Ashford and Indian Henry's. Expense from Seattle, $60. A one or a two weeks' outing can be arranged by application to Miss E. L. Chapman, 1018 Second Avenue, West Seattle.

National Association of Audubon Societies, 1974 Broadway, New York City.

President, William Dutcher, Plainfield, N. J.
Acting President, F. A. Lucas, American Museum of Natural History, New York.
Vice President, T. S. Palmer, United States Department of Agriculture, Washington, D. C.
Secretary and Executive, T. G. Pearson, 1974 Broadway, New York.
Treasurer, Jonathan Dwight, jr., 134 West Seventy-first Street, New York.
Membership.—Affiliated societies, 160; individual members, 4,850; total, 5,010.
Annual dues.—Sustaining, $5; life, $100.
Incorporated 1905. Annual meeting, last Tuesday in October.
Publication.—Bird-Lore (bimonthly), edited by F. M. Chapman, $1.50 a year.

National Parks Association, 914 Union Trust Building, Washington, D. C.

President, H. B. F. Macfarland, Evans Building, Washington.
Vice presidents, N. M. Butler, J. M. Clarke, William Kent, L. W. Noyes, Henry Suzzallo.
Secretary, R. S. Yard, 914 Union Trust Building, Washington.
Treasurer, C. J. Bell, 914 Union Trust Building, Washington.
Membership.—Annual, sustaining, life.
Dues.—Annual, $3; sustaining, $25; life, $500.
Organized 1919. Annual meeting, third Thursday in May.
Publications.—The association will issue a series of illustrated popular-science papers upon the scenery and wild life of the national parks and monuments.

National Park Service, United States Department of the Interior, Eighteenth and F Streets, Washington, D. C.

Director Stephen T. Mather, room 4141, Department of the Interior, Washington.
Assistant director, Arno B. Cammerer, room 4142, Department of the Interior, Washington.
Organized 1917.

Administers 18 national parks, 23 national monuments.

National Parks.—Crater Lake, Oreg.; General Grant, Calif.; Glacier, Mont.; Grand Canyon, Ariz.; Hawaii, H. I.; Hot Springs Reservation, Ark.; Lafayette, Me.; Lassen Volcanic, Calif.; Mesa Verde, Colo.; Mount McKinley, Alaska; Mount Rainier, Wash.; Platt, Okla.; Rocky Mountain, Colo.; Sequoia, Calif.; Sullys Hill, N. Dak.; Wind Cave, S. Dak.; Yellowstone, Wyo.; Yosemite, Calif.

National Park Conference will be held in November, 1919, at Denver, Colo.

A complete list of national park publications is given at page 351.

New York Zoological Society, 111 Broadway, New York City.

President, H. F. Osborn, American Museum of Natural History, New York.

Vice presidents, Madison Grant, 111 Broadway, New York; F. K. Sturgis, 30 Broad street, New York.

Secretary, Madison Grant, 111 Broadway, New York.

Treasurer, P. R. Pyne, 20 Exchange Place, New York.

Director of the Zoological Park, W. T. Hornaday, One Hundred and eighty-fifth street and Southern Boulevard, Bronx.

Director of the Aquarium, C. H. Townsend, Battery Park.

Membership.—Annual, 1849; sustaining, 12; fellows, 35; corresponding, 8; honorary, 7; life, 306; patrons, 32; associate founders, 9; founders, 15; founders in perpetuity, 18; benefactors, 7; total, 2298.

Dues.—Annual, $10; life, $200; patrons, $1,000; associate founders, $2,500; founders, $5,000; founders in perpetuity, $10,000; benefactors, $25,000.

Founded 1895. Annual meeting, second Tuesday in January.

Publications.—Zoological Society Bulletin (bi-monthly), edited by E. R. Sanborn, $1 a year; Zoologica (irregular), 25 cents a copy; Zoopathologica (irregular), 25 cents a copy; Tropical wild life in British Guiana, by William Beebe and others, $3; A monograph of the pheasants, by William Beebe, 4 volumes, $2.50 (volume 1 published); Our vanishing wild life, by W. T. Hornaday, $1.50; Popular official guide to the New York Zoological Park, by W. T. Hornaday, 30 cents; Annual report.

The library of the society is located in the Administration Building at the Zoological Park, One Hundred and eighty-fifth street and Southern Boulevard. It contains about 3,500 volumes, including zoological travel and exploration, and all branches of natural history.

Prairie Club, Chicago, Ill.

President, J. A. Russell, 1361 East Fifty-seventh street, Chicago.

Vice presidents, J. R. Bentley, 6732 Perry avenue, Chicago; Miss Josephine Pech, 4040 Prairie avenue, Chicago.

Secretary-treasurer, J. E. Bayrd, 1541 Monadnock Block, Chicago.

Membership.—Active, 671; associate, 129; honorary, 6; total, 806.

Entrance fee and dues.—Active, $4; associate, $1.

Annual dues.—Active, $2; associate, $1.

Organized 1908. Annual meeting, first Thursday in December.

Publications.—Bulletin (monthly), edited by L. T. Goble; year book.

Beach House, on the lake shore of the Dune country in northern Indiana, reached by Illinois Central Railroad to Pullman, and Chicago, Lake Shore & South Bend electric to Tremont.

Outings.—Saturdays, week ends, and frequent excursions.

1919 camp, August 2 to 23, at Schroeder, Minn., on Lake Superior. Expense from Chicago, about $73.

1919 outing, August 2 to 24, at Cumberland Gap, Tenn. Expense from Chicago, about $65.

Rocky Mountain Climbers Club, Boulder, Colo.

President, C. C. Casey, Longmont, Colo.

Vice president, F. A. Fair, Boulder, Colo.

Secretary, F. A. Boggess, Boulder, Colo.

Treasurer, Ernest Greenman, Boulder, Colo.

Membership—Degree members, 142; life, 40; total, 182.
Annual dues, $1; life, $10.
Organized 1910. Annual meeting, held in second week of August.
Club room in the Community House, Colorado Chautauqua grounds.
Outings—Week ends during July and August; 1919 outing, August 1 to 3 at Longs Peak, Rocky Mountain National Park. Expense from Boulder, $17.50.

Sagebrush and Pine Club, Yakima, Wash.

President, J. H. Wright, Yakima, Wash.
Vice president, Miss E. D. Scholes, Yakima, Wash.
Secretary-treasurer, Miss Carrie Grosenbaugh, 413 Miller Building, Yakima, Wash.
Membership—Active, 28; associate, 16; total, 44.
Annual dues, $5; associate, $1.
Organized 1915. Annual meeting, first Wednesday in January.
Outings—Saturdays and Sundays; 1919 outing, July 1 to 15, at junction of the Rattlesnake and Nachez rivers, Wash. Expense, $15 for 2 weeks; $10 for 1 week.

Sierra Club, 402 Mills Building, San Francisco, Calif.

President, W. E. Colby, 2901 Channing Way, Berkeley, Calif.
Vice president, V. L. Kellogg, Palo Alto, Calif.
Secretary-treasurer, J. N. LeConte, 19 Hillside Court, Berkeley, Calif.

SOUTHERN CALIFORNIA SECTION, ROOM 506, 424 SOUTH BROADWAY, LOS ANGELES, CALIF.

Chairman, P. S. Bernays, 318 West Third Street.
Secretary, C. J. Fox, 1443 Bellevue Avenue.
Outings—Saturdays, Sundays, and holidays.
Membership—Active, 1,768; life, 44; honorary, 15; total, 1,827.
Entrance fee and dues, $5; annual dues $3; life, $50.
Organized 1892. Annual meeting, first Saturday in May.
Publication, Sierra Club Bulletin (annually), edited by W. F. Bade, $0.50.
Club rooms and library, 402 Mills Building, San Francisco; LeConte Memorial Lodge, Yosemite Valley; Parsons Memorial Lodge, Tuolumne Meadows, Yosemite National Park; Muir Lodge, Big Santa Anita Canyon, reached by electric from Los Angeles to Sierra Madre.
Outings—Saturdays, Sundays, and holidays. Annual winter sports outing in January.
1919 outing, July 11 to August 10. Tuolumne Meadows via Yosemite Valley. Mount Ritter, Rainbow Falls, Devil Postpile, and Ten Lake Basin will be visited. Expense from San Francisco, $93; from Los Angeles, $104.50.

Tramp and Trail Club, New York City.

President, Frank Place, jr., 17 West Forty-third Street, New York.
Secretary-treasurer, A. B. Malcomson, jr., 2435 Morris Avenue, New York.
Membership—Active, 40; honorary, 5; total, 45.
Annual dues, $1.50.
Organized 1914. Annual meeting, middle of May.
Outings, Sundays and holidays.

Wild Flower Preservation Society of America, New York Botanical Garden, New York City.

President, H. C. Cowles, University of Chicago.
Secretary-treasurer, Mrs. N. L. Britton, New York Botanical Garden.
Managers, N. L. Britton, R. A. Harper, Norman Taylor, M. A. Howe, W. T. Davis.

Chapters in Baltimore, Md.; Chicago, Ill.; Fayette, Iowa; Milwaukee, Wis.; Philadelphia, Pa.; Riverside, Ill.; and Washington, D. C.

Membership—Junior, active, sustaining, fellows, patrons, and affiliated societies.

Annual dues—Active, $0.50; sustaining, $1; fellow, $25; patron, $50.

Organized 1902. Annual meeting in April or May.

Official organ, Torreya (monthly), edited by Norman Taylor. $1 a year.

The society is educating its members and the public in the appreciation and protection of plants and flowers for their natural beauty, and as food and shelter for birds and animals.

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